

Head to first gill opening  $4\frac{1}{2}$  to end of tail; disk length  $1\frac{1}{10}$  its width, tail  $\frac{3}{4}$  disk length. Snout  $1\frac{3}{5}$  in head; eye  $6\frac{3}{5}$ ,  $4\frac{1}{2}$  in snout, 2 in interorbital; mouth width  $2\frac{1}{3}$  in head, curved; teeth round disks with central conic cusp; preoral length  $1\frac{3}{4}$  in head; nostrils large, about last  $\frac{2}{5}$  in preoral length, internasal half preoral length; interorbital  $3\frac{3}{5}$  in head. Spiracles large, oblique, along hind eye edge, little larger than eye or long as orbit.

Small denticles on upper parts rough on snout end, rostral cartilages, interorbital, front edges of disk and pectorals; group of small tubercles at front inner portions of pectorals, row on orbital ridge and vertebral row from behind eyes to dorsals, somewhat broken behind center of disk and as more irregular rows along each side of tail above. Males with band of 2 or 4 series of depressible spines on outer portion of each pectoral.

Dorsals subequal, each equals combined eye and spiracle, interdorsal about half first dorsal base; pectorals form broad disk, front edges undulate, outer angle broadly convex, likewise hind angle; ventral deeply notched.

Blackish gray above, lateral regions of snout and pectoral edges flesh colored, under surface almost entirely white. Tip of snout above and below and point of tail beneath, black. Length, 480 mm. (Richardson.)

South Australia, Tasmania, Victoria, New South Wales, Queensland. Waite also notes the males with the teeth acutely spinous, in females nowhere spinous. Disk of male much more spiny and single median vertebral spine above, little above disk center. Single spine in interdorsal space. In female large patch of spines at front of pectorals absent and tail with 5 rows of spines. Waite notes the color of this species with scattered brown spots on the under side of the disk and yellow marks at the bases of the disks and on the ventral fins. Also the numerous pores on the underside of the snout and head black. One from New South Wales in the Queensland Museum.

#### RAJA SMIRNOVI Soldatov and Pawlenko

*Raja smirnovi* SOLDATOV and PAWLENKO, Ann. Mus. Zool., Acad. Imper. Sci. Petrograd, vol. 20, No. 1, p. 162, pl. 5, 1915 (type locality: Peter the Great Bay; Okhotsk Sea in lat.  $58^{\circ} 38' N.$ , long.  $152^{\circ} 45' E.$ , in 69 fathoms).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 111, 1925 (Fukui on Japan Sea; Takashima).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 21, pl. 1, 1930 (Far East Seas).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 262, fig. 21, 1932 (Chefoo).—TARANETZ, Western Branch Acad. Sci. U.S.S.R. No. 13, pp. 90, 91, 1935 (note).

*Raja omiruovi* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference; typographical error).

*Raja binoculata* (not Girard) SCHMIDT, Pisces marinum orientalium, p. 291, 1904 (Far East Seas).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 502, 1930 (reference).

*Raja meerervoorti* (not Bleeker) SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (part).

Head to spiracle 6 in total length; disk length  $1\frac{2}{5}$  its width, tail about  $\frac{5}{6}$  disk length. Snout  $1\frac{1}{3}$  in head to spiracle, broad, not extended at tip, angle slightly obtuse; eye 7 in head to spiracle,  $4\frac{1}{3}$  in snout, 3 in interorbital; interorbital  $2\frac{1}{4}$  in head to spiracle, broad, concave. Spiracle little oblique, close behind eye, equals eye.

Both upper and lower surfaces naked; only few minute spines or prickles present along front and hind borders of pectorals, on snout tip and on front and hind portions of orbit; 3 strong spines on middle of back in male, only 2 in female; 2 strong scapular spines, one each side of median line, in male as in female; no spines on middle of disk; tail with median row of 22 to 26 spines, wide band of coarser minute prickles on each side; under surface without spines and prickles. Wide lateral fold along each side of tail. Erectile pectoral spines well developed, usually radial, in 22 or 23 series and at most 6 or 7 hooks in series.

Dorsals high, subequal, about  $2\frac{4}{5}$  in head to spiracle, interdorsal very narrow deep notch, with spine in females; pectorals form broad rhomboidal disk, front edge broadly notched medially, outer and hind angles broadly convex; ventrals deeply notched.

Light brown above, whitish below, no spots or blotches. Length, 1,077 mm. (Soldatov and Pavlenko.)

Okhotsk Sea. Said to differ from *Raja binoculata* Girard in the absence of lateral spines on the tail. Described from 2 specimens, the larger a male taken as type.

#### RAJA HOLLANDI Jordan and Richardson

*Raja hollandi* JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 163, pl. 64, 1909 (type locality: Takao, Formosa).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).

*Raja hollandi* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 351, 1913 (compiled).

Head to spiracle  $5\frac{3}{4}$  in total; disk length  $1\frac{1}{6}$  its width, slightly longer than tail. Snout  $1\frac{1}{6}$  in head to spiracle, not much produced, ending in small point; eye  $5\frac{3}{4}$  in head to spiracle,  $4\frac{3}{4}$  in snout,  $2\frac{2}{5}$  in interorbital; mouth width  $1\frac{3}{5}$  in snout, scarcely undulate; teeth small, rounded, about 45 rows above; nostrils confluent with mouth, hind edges of nasal flaps fringed; interorbital  $2\frac{3}{5}$  in head to spiracle, concave. Spiracles close behind eyes, oblique, about  $\frac{4}{5}$  of eye.

Supraorbital semicircle of 8 or 10 short spines, directed backward; single median dorsal spine little farther behind eyes than interorbital; back and sides of tail with 5 rows of short backwardly directed spines; under snout edges till opposite first gill opening with numerous minute spines; body otherwise smooth.

First dorsal 3 in head to spiracle, second dorsal  $3\frac{1}{2}$ , or  $1\frac{1}{4}$  in interdorsal; caudal  $2\frac{1}{3}$  in head to spiracle; pectorals form broad rhomboid disk, front edges slightly undulate, outer angles broadly rounded, hind edges very slightly convex and hind angles broadly convex; ventrals deeply notched.

Brown above, lighter bluish to greenish beneath. Back and all upper surface, except tail and snout, densely covered with small black specks about size of coffee grains. Snout translucent, upper surface appearing whitish in reflected light. Numerous pores on under side of snout and sides of mouth each surrounded with black circle. Tail brownish above, paler with some dusky underneath. Length, 370 mm. (Jordan and Richardson.)

Formosa.

**RAJA BARNARDI** Norman

*Raja barnardi* NORMAN, Discovery Rep., vol. 12, p. 43, fig. 14, 1935 (type locality: Lat.  $34^{\circ}$  S., long.  $17^{\circ}58'$  E., in 173–210 m., off Capetown).

Disk little broader than long, width scarcely  $\frac{3}{5}$  total length; front margins little undulated; outer angles smoothly rounded. Vent little nearer to snout tip than to end of tail. Snout with rather short, obtuse, triangular projection, its length  $4\frac{1}{2}$  in disk width. Interorbital equals eye; combined eye and spiracle  $2\frac{2}{3}$  in snout. Internarial width  $2\frac{1}{3}$  in preoral length of snout. Teeth more or less pointed in middle of jaws; rows 40 to 42.

Upper surface of disk and tail mainly smooth, but large patch of spinules on front part of each pectoral, and some scattered spinules on snout, interorbital, middle of back and hind parts of pectorals; 2 preocular and 4 postocular spines; 3 median nuchal spines, with smaller one on each side; single median spine above suprascapular region; 2 scapular spines; 24 median spines extending from just behind suprascapular region to first dorsal; front part of tail with somewhat irregular series of spines on each side; edges of tail with numerous small spines. Lower surface quite smooth except at edges of snout.

Upper surface brownish, with traces of small pale spots. Lower surface uniformly pale.

Length, 375 mm., 210 mm. across disk. (Norman.)

South Africa.

**RAJA KATSUKII** Tanaka

*Raja katsukii* TANAKA, Fishes of Japan, vol. 35, p. 662, pl. 154, figs. 426–428, 1927 (type locality: West coast Province Mutsu, Japan).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (compiled).

Head to spiracle  $5\frac{1}{3}$  in total; disk length  $1\frac{1}{5}$  in its width, tail  $1\frac{1}{3}$  in disk length. Snout  $1\frac{1}{5}$  in head to spiracle, slightly produced with rather bluntly pointed tip; eye  $5\frac{4}{5}$  in head to spiracle,  $4\frac{2}{3}$  in

snout,  $2\frac{1}{8}$  in interorbital; mouth slightly waved, width  $1\frac{3}{4}$  in preoral length from mouth corner; teeth above, flattish, paved, in 50 rows; front nasal valve tubular, hind flap slightly produced and recurved; hind nasal valve large, with fringes posteriorly; internarial  $1\frac{1}{2}$  in space between latter and snout tip; interorbital  $2\frac{1}{2}$  in head to spiracle. Spiracles directly behind eye, edges entire, little oblique, about equal eye.

Row of supraorbital spines each side, before eye and on inner spiracle edge; single median row of 3 spines on shoulder girdle; small group of very small spines at median line of snout somewhat near tip, on middle and posteriorly; 1 or 2 rows of weaker small irregular spines on sides near middle above abdomen, none on median line; rather small recurved biserial spines within hind lateral disk edge; 5 rows of spines on tail, supero-lateral row begins more anteriorly; interdorsal with 3 spines interspersed with several smaller ones between; body otherwise naked.

Two small dorsals, subequal, interdorsal equals dorsal bases; second dorsal well separated from rudimentary caudal; pectorals form rhomboid disk, front edge nearly straight, outer and hinder angles broadly rounded; ventrals rather shallowly notched.

Rusty red, profusely marked with brownish, irregularly curved continuous lines, forming ground color polygonal or irregular areas and spots. Opposite outer disk angle on each side near median line reticulated marking about equal to orbit, more or less surrounded by broad area of ground color. Under surface whitish, excepting median portion near snout tip, region around mouth and gill openings and sides of abdomen to ventral insertion, these all irregularly blotched and soiled darker. Length, 395 mm. (Tanaka.)

Japan. According to Tarantzev this species is a synonym of *Raja kenojei*.

#### RAJA KENOJEI Müller and Henle

*Raja kenojei* (Bürgers) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 149, pl. 47, 1841 (type locality: Southwest coast of Japan; Nagasaki market).—RICHARDSON, Ichth. China Japan, p. 197, 1846 (Seas of China and Japan; Canton).—SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 308, 1850 (Nagasaki).—GRAY, List fish British Museum, p. 112, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Nagasaki; China); Act. Soc. Sci. Indo-Néerland., vol. 3, No. 3, p. 3 (Kioesio), p. 7 (Japan), p. 42, 1858; vol. 8, p. 65, 1860 (Nagasaki).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 556, 1865 (compiled).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 461, 1870 (Japan).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—NYSTRÖM, Svenska Vet. Akad. Handl., vol. 13, pt. 4, p. 51, 1887 (Nagasaki).—? ELERA, Cat. Fauna Filip., vol. 1, p. 620, 1895 (Luzon, Manila, Samar, Borongan, Paragua, Puerto Princesa).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 60, 1897.—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).—PIETSCHMANN,

*Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl.*, vol. 117, pt. 1, p. 646, 1908 (Japan).—*IZUKA* and *MATSUURA*, *Cat. Zool. Spec. Tokyo Mus. Vertebrata*, p. 187, 1920 (Tokyo).—*JORDAN* and *HUBBS*, *Mem. Carnegie Mus.*, vol. 10, p. 113, 1925 (Misaki, Toyama, Miyazu).—*FOWLER*, *Proc. 4th (1929) Pacific Sci. Congr., Java*, p. 501, 1930 (Japan); *Hong Kong Nat.*, vol. 1, p. 136, fig. 18, 1930 (Japan).—*SOLDATOV* and *LINDBERG*, *Bull. Pacific Sci. Fisher. Inst.*, vol. 5, p. 19, 1930 (Far East Seas).—*SCHMIDT*, *Trans. Pacific Comm. Acad. Sci. U.S.S.R.*, vol. 11, p. 11, 1931 (Nagasaki; Kagoshima; Misaki; Fusan).—*TANAKA*, *Jap. Fish. Life Colours*, No. 31, 1933.—*TARANETZ*, *Bull. Associate Acad. Sci. S.S.S.R.*, Nos. 1–3, p. 67, 1933.—*WANG*, *Contrib. Biol. Lab. Sci. Soc. China*, vol. 9, p. 105, fig. 7, 1933 (Chusan).—*TARANETZ*, *Bull. Associate Acad. Sci. S.S.S.R.*, No. 13, 1935 (note).

*Raja kenojei* *GARMAN*, *Mem. Mus. Comp. Zool.*, vol. 36, p. 351, pl. 24, figs. 1–2, 1913 (Idzu Sea, Japan).

*Raja meerdervoortii* *BLEEKER*, *Act. Soc. Sci. Indo-Néerl.*, vol. 8, no. 1, p. 66, 1860 (type locality: Nagasaki).—*PIETSCHMANN*, *Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl.*, vol. 117, pt. 1, p. 642, 1908 (Japan).—*IZUKA* and *MATSUURA*, *Cat. Zool. Spec. Tokyo Mus. Vertebrata*, p. 187, 1920 (Agamushi).

*Raja meerdervoortii* *JORDAN* and *SNYDER*, *Annot. Zool. Japon.*, vol. 3, p. 42, 1901 (reference).—*SNYDER*, *Proc. U. S. Nat. Mus.*, vol. 42, p. 401, 1912 (Otaru, Mororan, Hakodate).

*Raja japonica* *NYSTRÖM*, *Svenska Vet. Akad. Handl.*, vol. 13, pt. 4, p. 52, 1887 (type locality: Nagasaki).—*JORDAN* and *SNYDER*, *Annot. Zool. Japon.*, vol. 3, p. 42, 1901 (reference).

*Raja smirnovi* (not Soldatov and Pavlenko) *JORDAN* and *HUBBS*, *Mem. Carnegie Mus.*, vol. 10, p. 111, 1925.

*Raja tengu* (not Jordan and Fowler) *SOLDATOV* and *LINDBERG*, *Bull. Pacific Sci. Fisher. Inst.*, vol. 5, p. 20, fig. 3, 1930 (Far East Seas).

Depth  $13\frac{1}{2}$  to 15 to end of tail; head  $4\frac{1}{4}$  to  $4\frac{1}{2}$ ; disk length  $1\frac{1}{4}$  to  $1\frac{1}{3}$  in its width and tail less than disk. Snout  $1\frac{1}{2}$  to  $1\frac{3}{5}$  in head, tip slightly produced and rounded; eye 4 to  $4\frac{1}{5}$  in snout,  $2\frac{1}{2}$  to  $2\frac{7}{8}$  in interorbital; dentary width 3 to  $3\frac{1}{8}$  in head; teeth in 30 to 45 rows in jaws, small, each with low cusp as keel; nostrils small, internarial space equals dentary width, front section of inner nasal valve little longer than hind valve; interorbital  $2\frac{1}{2}$  to  $2\frac{3}{5}$  in head, depressed concavely. Gill openings small, equidistant, subequal. Spiracle subequal with eye, close behind eye, edge without grooves.

Body largely smooth, especially with age. In young tubercles strong and prominent, 2 preocular, 1 above each spiracle, 1 occipital with median vertebral row beginning on tail about opposite ventral origins, continued as 10 to 13 spines to first dorsal and 1 or 2 in interdorsal; with age spines much less distinct and largely evident only on tail posteriorly.

First dorsal broad, length  $3\frac{1}{2}$  to 4 in head; second dorsal similar,  $3\frac{1}{3}$  to 4; caudal low, continuous fold from second dorsal; pectoral rather obtusely rounded; ventral length  $1\frac{1}{8}$  to  $1\frac{1}{2}$  in head; claspers broad, flat, extend  $\frac{2}{3}$  to hind ventral tips.

Brown above, in young with variable scattered obscure whitish spots, often variably clustered in middle of disk. At each side of middle of disk rounded to ellipsoid dark or dusky blotch, always larger than eye, sometimes with white or pale center, again as 2 dark rings with one inside the other. In addition sometimes a white blotch of similar size, with dark ring as border, may be present little outside and posterior, also small blackish blotch on hind part of pectoral near base. Large examples show body more uniform, without trace of dark spots, though often a white blotch may occur on each pectoral little behind its middle.

China, Japan. Though listed from several localities in the Philippines by Elera, no other records have ever been given and until they are established by unquestioned materials they had best remain as doubtful. I have followed Garman in placing *Raja meerervoortii* Bleeker with this species. My specimens show a great range of variation in color markings with age.

6842. Kowloon, China. October 20, 1908. Bureau of Fisheries. Length, 435 mm. Tail with 5 rows of thorns. Blotchlike cluster of small dark spots on pectoral posteriorly and marginally.

1976 [189]. D 5310. Lat. 21°33' N., long. 116°13' E., China Sea, vicinity of Hongkong. November 4, 1908. Length, 124 mm. Armature largely absent, mostly smooth. Cluster of dark spots opposite and close to eyes and another larger at middle of pectoral base, besides some dark spots in interorbital and few obscureumber spots about hind portions of pectorals.

1488. D. 5388. Bagatao Island Light (outer), S. 86° E., 21 miles (12°51'30" N., 123°26'15" E.), between Burias and Luzon. March 11, 1909. Like the following. Both armed as in Müller and Henle's plate. Disk above with very minute asperities, giving rough velvety touch. Length, 298 mm.

1488. D. 5326. Hermanos Island (N.), N. 69° E., 8 miles (18°32'30" N., 122°01' E.). November 12, 1908. 2 examples. Length, 290 mm. Lower surfaces nearly dark as back or upper surfaces. Disk above largely smooth.

U.S.N.M. No. 22612. Miuramisaki, Japan. April 23, 1898. Japanese Government. Length, 482 mm.

U.S.N.M. No. 48198. Japan. S. Nozawa. Length, 173 mm.

U.S.N.M. No. 50731. Tokyo, Japan. Jordan and Snyder. Length, 266 mm.

U.S.N.M. No. 50732. Hakodate, Japan. Jordan and Snyder. Length, 200-222 mm. 3 examples.

U.S.N.M. No. 59797. Kagoshima, Japan. Dr. H. M. Smith. Length, 116 mm.

U.S.N.M. No. 59798. Kochi, Japan. Dr. H. M. Smith. Length, 200 mm.

U.S.N.M. No. 59800. Kagoshima. Dr. H. M. Smith. May 7, 1903. Length, 275 mm., very poor.

U.S.N.M. No. 71129. Japan. Bureau of Fisheries. Length, 187 mm.

U.S.N.M. No. 71801. Hakodate, Japan. Albatross collection. Length, 150 to 180 mm. 5 examples.

U.S.N.M. No. 71830. Tokyo market. Albatross collection. Length, 452 mm.

Male with long clavate claspers, equal head measured to first gill opening.

U.S.N.M. No. 71904. Tokyo market. Albatross collection. Length, 470 mm.

U.S.N.M. No. 75875. Japan? P. L. Jouy. Two examples, 373 and 437 mm. Smaller male with long clavate claspers nearly long as head.

## RAJA MIRALETUS Linnaeus

*Raja miraleetus* LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 231, 1758 (type locality: Mediterranean Sea).—BONAPARTE, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 3, descr., pl. fig. 2, 1833 (Italy); Cat. Metod. Pesci Europei, p. 14, 1846 (Mediterranean).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Bonaparte material).

*Raja miralctus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 324, 1913 (off southern Europe).—VON BONDE and SWART, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 5, 1924 (compiled).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 68, 1925 (Agulhas Bank, in 36 fathoms; Natal).

*Raja bimaculata* GEOFFROY SAINT-HILAIRE, Descr. Egypte, Poiss., vol. 1, pl. 24, fig. 2, 1809 (type locality: Egypt).

*Raja percomaculata* VON BONDE and SWART, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 9, pl. 21, fig. 2, 1924 (type locality: Station 116, South Africa, in 298 fathoms).

Snout  $1\frac{1}{4}$  to  $1\frac{1}{3}$  in head; orbit 1 to  $1\frac{1}{5}$  in interorbital; mouth width  $2\frac{1}{4}$  to  $2\frac{4}{5}$  in head; teeth 32 to 41 above, 35 to 40 below; internarial  $2\frac{1}{3}$  to  $2\frac{7}{8}$  in head; preoral length  $1\frac{1}{6}$  to  $1\frac{1}{3}$ ; interorbital  $4\frac{3}{4}$  to 6.

Spines before and behind eyes vary 1 to 3, on back medianly sometimes reduced to 1. In smaller examples median series on tail continuous till close up behind eyes and again additional 1 on each side of back anteriorly. In some cases median series on tail become rather reduced in size and inconspicuous in males. Large female with 5 series of large spines on back of tail anteriorly and another shows traces of same number.

First dorsal length  $2\frac{1}{2}$  to  $3\frac{2}{7}$  in head; front ventral  $1\frac{2}{3}$  to 2.  
South Africa, Natal. Also in the Atlantic.

12 examples. A.N.S.P. Italy. C. L. Bonaparte No. 224, also skeleton same data. Length 165 to 421 mm., width 96 to 263 mm.

## RAJA OCCELLIFERA Regan

*Raja ocellifera* REGAN, Ann. Natal Gov. Mus., vol. 1, p. 2, pl. 2 (type locality: Algoa Bay and Natal coast, 40 fathoms), p. 242, 1906 (Bird Island).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 365, 1913 (South Africa).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 3, p. 286, 1916 (compiled).—VON BONDE and SWART, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 5, 1924 (compiled).—BARNARD, Ann. South African Mus., vol. 21, p. 67, 1925 (False Bay to Natal); vol. 21, pt. 2, p. 1015, 1927 (note).

*Raja ocellifera* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 193 (Natal).—NORMAN, Discovery Rep., vol. 12, p. 42, 1935 (False Bay, Agulhas Bank, off Cape St. Blaize, Algoa Bay; Natal; types).

*Raja capensis* (not Gmelin) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 151, 1841 (type locality: Cape of Good Hope).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 540, pl. 12, figs. 11–12 (tubercle and spine), 1865 (types).—KNER, Reise Novara, Fische, p. 419, 1865 (Cape of Good Hope).

*Raja capensis* VON BONDE and SWART, Marine Biol. Surv. South Africa Rep. pt. 3, 1922, p. 4, 1924 (South Africa, in 146–160 fathoms).

Depth  $2\frac{1}{4}$  in snout; head to first gill opening 2 in length to vent. Snout  $1\frac{1}{3}$  in head to spiracles, produced in short point; eye  $2\frac{3}{4}$  in snout,  $1\frac{1}{5}$  in interorbital; mouth width  $1\frac{3}{4}$  in preoral length; firm interorbital  $2\frac{2}{3}$  in snout.

Before each eye strong divergent spines and 1 close behind; strong median vertebral spine  $1\frac{1}{4}$  in eye; down back of tail row of 10 spines to first dorsal, also spine between dorsals.

First dorsal opposite middle of tail; pectorals form disk length  $1\frac{1}{4}$  in its width, front angle obtuse, front edges slightly undulate; tail to base little longer than disk length,  $1\frac{1}{3}$  in disk width.

Above chocolate, with variable scattered neutral dusky spots, few or obsolete toward disk margins and none oscillated. On caudal 5 transverse neutral dusky bands or blotches. Below whitish, margin of disk grayish.

South Africa, Natal.

1 example A.N.S.P. Natal. H. W. Bell Marley. Length, 183 mm.

2 egg cases A.N.S.P. Natal. H. W. Bell Marley. Length, 80 mm.

#### RAJA CAUDASPINOSA Von Bonde and Swart

*Raia caudaspinosa* VON BONDE and SWART, Marine Biol. Surv. South Africa Rep., pt. 5, p. 8, pl. 21, fig. 1, 1923 (type locality: Natal coast, in 280 fathoms).—BARNARD, Ann. South African Mus., vol. 21, p. 66, 1925 (Natal).

*Raja caudaspinosa* NORMAN, Discovery Rep., vol. 12, p. 37, 1935 (lat.  $34^{\circ}8'$  S., long.  $17^{\circ}33'$  E., in 302?–548 m.; lat.  $38^{\circ}48'$  S., long.  $17^{\circ}29'30''$  E., in 235–402 m.).

Head to spiracle  $7\frac{1}{4}$  in total; disk length  $1\frac{1}{3}$  its width, tail slightly longer than rest of body. Snout  $1\frac{1}{2}$  in head measured to spiracle, blunt, hardly produced, angle very obtuse; eye  $3\frac{3}{5}$  in head to spiracle,  $2\frac{4}{5}$  in snout,  $2\frac{1}{2}$  in interorbital; teeth in numerous rows, square based and sharp pointed; 3 suprascapular spines each side from region 3 rows of large stellate-based spines extend all space to first dorsal where median series ends, lateral series continue to end of tail either side dorsal and caudal; spines gradually smaller towards end of tail; all way from shoulder to first dorsal spines of lateral series larger than median series; also on sides of compressed tail from root to nearly half way 2 belts of numerous, minute spines, belts narrowing until at middle of tail continued as single row of small spines to end of tail; outer nasal edges with grooved, fringed, long, projecting funnel-like flaps and fringed flaps over mouth corners; interorbital  $1\frac{1}{5}$  in head to spiracle, flat. Spiracles slightly inclined from horizontal, little less than eye and close behind.

Except smooth areas behind spiracles either side and either side median line above abdomen disk sparsely covered with stellate based spines; latter as 2 broad belts on front disk edges, rostrum, interorbital and orbital ridges, as triangular cluster behind head including region of shoulder girdle; on hind disk edges each side group of

scattered spines, between groups and belts on front edges few scattered spines; 6 spines on orbital ridge.

Dorsals oval and caudal continuous along slightly raised median fold, no spine between dorsals, all 3 covered  $\frac{3}{4}$  either side with small spines in belt from front part of base along dorsal margin of fins backwards. Pectorals form subcircular disk, front edges sinuous, slightly concave behind and convex in wide curve opposite eyes.

Uniform dusky gray or mud color. Lower surface white. Length, 346 mm. (Von Bonde and Swart.)

Natal.

**RAJA ANNANDALEI** Weber

*Raja annandalei* WEBER, *Siboga* Exped., Fische, vol. 57, p. 598, 1913 (type locality: Between Kajoa and Batjan, in 397 m; Halmahera Sea, in 827 m).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (compiled).

Snout somewhat prominent; mouth transverse, bowed medially, width nearly half preoral; teeth in 40 to 42 rows, median bowed and longer than laterals, bases oval heart-shaped; interorbital somewhat less than  $\frac{1}{3}$  snout length from eye or from middle of mouth. Spiracle not large, diameter  $\frac{2}{3}$  horizontal eye diameter.

Whole back more or less covered with small denticles, absent each side of snout tip; large, curved, hooked thorns, on round bases, 3 in middle of snout, 2 or 3 before and 1 behind orbital edge, 1 above spiracle, 4 in mid-line of back; in middle of each pectoral group of 5 depressible; on upper side of tail 3 rows of thorns, 30 in median row and each side row with 25 or 26; upper side of tail with fine denticles; under side of disk and tail smooth.

Dorsals equally long and bases in contact; caudal low fold; pectorals form disk width greater than space between snout tip and caudal base; front pectoral angles scarcely sinuous, lateral angles rounded; cloaca nearly  $\frac{1}{4}$  nearerer snout end than caudal end.

Upper surface of body clear gray. Dorsals brownish. Under surface of body, including ventrals and tail, chocolate color. Disk length, 154 mm., width 190 mm. (Weber.)

East Indies. According to Weber young above dark gray, below whitish with reddish. Near *Raja reversa* Lloyd.

**RAJA MAMILLIDENS** Alcock

*Raja mamillidens* ALCOCK, Anu. Mag. Nat. Hist., ser. 6, vol. 4, p. 380, 1889 (type locality: Gulf of Manaar, in 597 fathoms); Illustr. Zool. *Investigator*, pl. 8, fig. 1, 1892; Cat. Deep Sea Fishes Indian Mus., p. 19, 1899 (type).

*Raia mammillidens* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 350, 1913 (compiled).

Head to spiracle  $6\frac{1}{2}$  in total length; disk length  $1\frac{1}{2}$  its width or  $2\frac{1}{10}$  in total length. Snout  $1\frac{1}{6}$  in head to spiracle, short, broad, only slightly exserted; eye  $6\frac{1}{4}$  in head to spiracle,  $5\frac{2}{3}$  in snout,  $3\frac{1}{4}$  in interorbital; mouth crescentic; teeth in female with globular base and

mammary point, 24 oblique rows in upper jaw, 18 in lower; interorbital  $1\frac{3}{5}$  in head to spiracle. Spiracle close behind along hind eye edge, nearly equals orbit.

Whole upper surface of disk, including ventrals and tail, all surfaces of posterior half of tail including dorsals and rudimentary caudal, covered with small, sharp, close set prickles; large spine at each angle of each orbit, pair between spiracles, 1 or 2 on each shoulder girdle each side center of disk and single row down middle of back from occiput nearly to first dorsal fin; under surface of disk smooth and glandular.

Dorsals adjacent, separate, posterior larger or about 2 in head to spiracle, interdorsal very narrow notch; pectorals form rhomboidal disk, angles rounded, front edges slightly and broadly sinuous.

In life uniform jet black, dark chocolate in spirit. Length, 292 mm. (Alcock.)

India. Known only from the type, a female in the Indian Museum.

#### RAJA DURBANENSIS Von Bonde and Swart

*Raja durbanensis* VON BONDE and SWART, Marine Biol. Surv. South Africa Rep., pt. 5, p. 11, pl. 22, fig. 1, 1923 (type locality: Natal coast, in 470 fathoms).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 69, 1925 (Natal coast).

Head to spiracle  $6\frac{3}{5}$  in total; disk length  $1\frac{1}{3}$  its width,  $2\frac{1}{3}$  in tail. Snout  $1\frac{1}{4}$  in head measured to spiracle, front edges almost straight and meet at acute angle; eye 5 in head to spiracle,  $4\frac{1}{3}$  in snout,  $2\frac{1}{3}$  in interorbital; mouth nearly straight,  $2\frac{1}{3}$  in preoral length; teeth in numerous rows, rhombic based and slightly denticulate; outer nostril edges with funnel-shaped flaps and slight fringed flaps cover mouth corners; interorbital  $2\frac{1}{4}$  in head to spiracle, flat. Spiracles small, oblique, close behind eyes, smaller than eyes.

Whole upper surface, including sides of tail, covered with small spines; under surface smooth; stellate based spine before each orbit and 2 behind; row of equally large median spines from behind head to tail to first dorsal; 2 suprascapular spines on each shoulder, 1 large and other small.

Dorsals separate, small, pointed, first little larger or  $1\frac{2}{3}$  in snout; caudal minute; pectorals form quadrangular to rhombic disk, front margins nearly straight, outer angles, posterior margins and angles broadly rounded; ventrals pointed posteriorly and notched about to middle.

Reddish brown. Dorsals, caudal, and lateral folds deep reddish brown. Under surface as above, except areas around mouth and abdomen, which white. Tail below like body. Length, 232 mm. (Von Bonde and Swart.)

Natal.

## RAJA ISOTRACHYS Günther

*Raja isotrachys* GÜNTHER, Ann. Mag. Nat. Hist., London, ser. 4, vol. 20, p. 434, 1877 (type locality: Coast of southern Japan, in 365 fathoms); Rep. Voy. Challenger, vol. 22, p. 7, pl. 3, 1887 (lat.  $34^{\circ} 7'$  N., long.  $138^{\circ}$ , E., in 365 fathoms).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 649, 1903 (compiled).—TANAKA, Fishes of Japan, vol. 35, p. 670, pl. 155, figs. 430–432, 1927 (Mororan to Hokkaido, Kesen).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).

*Raja isotrachys* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 354, 1913 (compiled).

Head to spiracle  $5\frac{2}{3}$  in total; disk length  $1\frac{1}{5}$  its width, slightly greater than tail. Snout  $1\frac{1}{6}$  in head to spiracle, not produced, would form slightly obtuse angle, slight notch either side near tip; eye  $4\frac{1}{2}$  in head to spiracle;  $4\frac{3}{4}$  in snout,  $2\frac{4}{5}$  in interorbital; mouth slightly waved, width  $2\frac{1}{5}$  in preoral length from mouth corner; teeth subequal, bluntly pointed, upper about 35 rows; oronasal groove, internarial  $2\frac{1}{3}$  in space to snout tip and little greater than mouth width, hind valve large, with rather weakly developed fringes posteriorly; interorbital 2 in head to spiracle. Spiracles directly behind eye, oblique, little greater than eye.

Body and tail entirely covered above with small asperities, each with stellate base and spine at center; no spine on superciliary edge; on back near front end of vertebral column pair of larger spines, interspace equals interorbital; asperities about middle of interspace between spines larger than others; about 20 median spines in row on tail end at first dorsal; under surface smooth.

Dorsals subequal, about 3 in snout, interspace about  $\frac{1}{5}$  base of first; caudal rudimentary,  $3\frac{1}{2}$  in snout; pectorals form rhomboid disk, front edges slightly undulate, broad angle blunt and convex, hind edge broadly convex, likewise hind angle; ventrals deeply notched.

Above uniform purplish brown, narrowly edged much darker on posterior edge of disk. Hind ventral edges darker narrowly. Below whitish, edged with dark color on hind edge of disk and ventrals, corresponding with upper surface. Length 600 mm. (Tanaka.)

Japan.

## RAJA TOBAE Tanaka

*Raja tobae* TANAKA, Dobuts. Zasshi, Tokyo, vol. 28, p. 313, 1916 (type locality: Miyazu).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 113, 1925 (Miyazu; Tokyo market; Toba market; Kagoshima Bay; Mikawa Bay).—TANAKA, Fishes of Japan, vol. 35, June 20, p. 673, 1927 (Kesen in Rikuzen); vol. 36, pl. 156, figs. 434–436, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 264, fig. 22, 1932 (Chefoo).—WANG, op. cit., vol. 9, No. 3, p. 104, 1933 (Chusan).

*Raja meerervoortii* (not Bleeker) JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 337, 1900 (Tokyo).—PAVLENKO, Minutes Kazan Soc. Naturalists, vol. 42, p. 11, 1910 (Petri Magni Bay).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Hakodate).—JORDAN, TANAKA, SNYDER, Journ. Coll. Sci. Tokyo, vol. 33, p. 26, fig. 1913 (Japan).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, No. 3, p. 3, 1928 (Fusan, Korea).

*Raja meerervoortii* JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 650, fig. 7, 1903 (Tokyo, Nagasaki, Kobe, Wakanoura, Hakodate).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 31, p. 515, 1906 (Port Arthur, Manchuria).

*Raja meerervoortii* SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 460, 1906 (Kochi; Kagoshima).

*Raja meerervoortii* ENGELHARDT, Abh. Bayer. Akad. Wiss., vol. 4, pt. 3, p. 102, 1913 (Munich Museum).

Head to spiracle  $8\frac{2}{3}$  in total length; disk length  $1\frac{1}{4}$  in its width,  $1\frac{2}{5}$  in tail. Snout  $1\frac{1}{8}$  in head to spiracle, would form wide obtuse angle, with short point at tip; eye  $3\frac{1}{2}$ ,  $2\frac{7}{8}$  in snout,  $1\frac{4}{5}$  in interorbital; mouth slightly waved, width  $1\frac{3}{4}$  in space between mouth corner and snout tip; teeth in 31 rows, subequal, bluntly pointed; oronasal groove present, anterior nasal valve tubular, posterior valve large, without or with weak fringes, internarial  $1\frac{1}{3}$  in distance to snout tip, subequal in length to mouth width; interorbital  $1\frac{9}{10}$  in head to spiracle.

Body and tail above entirely covered with small asperities, each with stellate base and spine at center; no large spines on supr orbital; on back near front part of vertebral column 2 large spines each side, pair nearer median line larger; row of large vertebral spines from middle of back to dorsals of which 12 to 14 before vent and 25 to 29 posterior; 1 or 2 interdorsal spines; under surface smooth.

Dorsals small, first little larger or  $2\frac{2}{3}$  in head to spiracle, interdorsal  $\frac{3}{5}$  base of first; caudal low small fold; pectorals form rhomboid disk, front edge undulate, outer and hind angles broadly convex.

Uniform purplish brown, narrowly edged darker in hinder and inner margins. Hind ventral edge narrowly edged darker. Under surface whitish, hind edges of disk and ventrals broadly edged with dark dusky. Length, 282 mm. (Tanaka.)

Japan, Korea, Manchuria. Included by Tarantzev as a synonym of *Raja kenojei*.

2 examples. A.N.S.P. Hakodate, Japan. Stanford University. Snout  $1\frac{1}{4}$  in head; interorbital  $3\frac{4}{5}$  to 4; mouth width  $2\frac{3}{7}$  to  $2\frac{2}{3}$ ; internasal  $2\frac{3}{7}$  to  $2\frac{2}{3}$ ; preoral length  $1\frac{1}{10}$  to  $1\frac{1}{8}$ ; first dorsal length 3 to 4; front ventral edge  $1\frac{3}{4}$ ; upper teeth 38 to 40, lower 37 or 38. Single median thorn on back. Preocular spines 2, postocular 1. Dusky pores or ducts of Lorenzini below. Row of spines down tail above. Spine between dorsals. Lateral folds of tail well developed. No caudal fold. One with copepod parasite on upper surface of ventral. Both males.

**RAJA KUJIENSIS** Tanaka

*Raja kujiensis* TANAKA, Dobuts. Zasshi, Tokyo, vol. 28, p. 173, 1916 (type locality: Kuji, in Hitachi, northeast of Tokyo).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 109, 1925 (translation).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (compiled).

Disk rhomboid, wider than long inclusive of ventrals. Snout slightly pointed, tip forming angle of  $140^{\circ}$  length twice interorbital; teeth in 25 rows in jaws. Spiracle shorter than eye.

Body with uniformly scattered small spines, very few in small area behind spiracle, none on eye border only; large spines in single row from behind eye to second dorsal on midline of back; near disk center pair of rather large spines either side of line of mid-dorsal spines; lower surface of disk entirely smooth.

Disk weakly crenulate in front edges, rounded at outer angle forming angle about  $100^{\circ}$ , hind disk angles rounded in angle about  $90^{\circ}$ .

Purplish brown, with few black spots, scattered irregularly and unsymmetrically in relation to middorsal white. Below dead white, with few dusky spots, margin dusky gray. Length, 825 mm. (Tanaka.)

Japan.

**RAJA NASUTA** Müller and Henle

*Raja nasuta* (Banks) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 150, 1841 (type locality: Australia, Ocean near Totaranni, New Zealand).—GRAY, List fish British Museum, p. 112, 1851 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 572, 1865 (copied).—HECTOR, Colonial Mus. Government. Surv. Rept. (Fishes New Zealand), p. 84, 1872.—HUTTON, Trans. Proc. New Zealand Inst., vol. 8, p. 216, 1876 (Oamaru).—HECTOR, Handb. New Zealand, p. 16, 1879.—WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 18, pl. 19, pl. 21, fig. 2, 1909 (Chatham Islands, New Zealand, 9–105 fathoms).—RENDAHL, Vidensk. Medd. Dansk naturh. Foren. Kjöbenhavn, vol. 81, p. 1, 1925 (Napier).—YOUNG, Trans. New Zealand Inst., vol. 60, p. 140, 1929 (Chatham Islands).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

*Raja nasuta* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 366, 1913 (New Zealand and Australia).

*Raya oxyrhynchus* (not Linnaeus) CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 224, 1872 (Victoria).

*Raya rostrata* (not Lacépède) CASTELNAU, Victoria Office Rec. Philadelphia Exhib. (Intercal. Exhib. Essays No. 5), p. 17, 1873 (Melbourne); Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 57, 1873 (on above).

*Raja rostrata* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, pt. 2, p. 312, 1880 (Port Phillip); vol. 6, p. 376, 1881 (Port Phillip).

*Raya scabra* OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 17, 1888 [type locality: Manly, New South Wales; Port Phillip, Victoria (on *Raya rostrata* Castelnau)].

*Raja scabra* LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 11, 1927.

Depth  $1\frac{4}{5}$  to end of tail; head  $3\frac{4}{5}$ ; disk length  $1\frac{1}{6}$  in its width, tail less than disk. Snout  $1\frac{1}{3}$  in head, moderately long, produced in rather broad tip; eye 9,  $6\frac{2}{5}$  in snout, 3 in interorbital; dentary width  $2\frac{4}{5}$  in head; teeth in 44 rows in jaws, small, each with low cusp; nostrils small, front valve moderate, internarial equals dentary width; interorbital 3, depressed concavely. Gill openings small, subequal, equidistant. Spiracle slightly less than eye, deep, broad, edges entire.

Skin above rough to touch, asperities large on end of snout and rostral cartilages terminally, before each eye and in interorbital; 4 large tubercles along superciliary edge, besides smaller one outward and directly before eye; large occipital tubercle ends in sharp-pointed spine, followed by smaller one; from above ventrals row of strong vertebral tubercles, 24 to first dorsal and 2 more in interdorsal space; sides of tail roughly asperous.

First dorsal broad, length 5 in head; second dorsal  $5\frac{1}{2}$ , similar; moreover the body appears much rougher.

New South Wales, Victoria, New Zealand.

U. S. N. M. No. 39667. New Zealand. Otago University. Length, 410 mm.

**RAJA MURRAYI** *Günther*

*Raja murrayi* *GÜNTHER*, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 15, pl. 5, 1880 (type locality: Kerguelen Island).

*Raia murrayi* *GARMAN*, Mem. Mus. Comp. Zool., vol. 36, p. 364, 1913 (compiled).

Head to first gill opening nearly 5 in total length; disk length  $1\frac{1}{3}$  its width, 2 in total length. Snout  $1\frac{3}{4}$  in head, forms slightly obtuse angle with end somewhat projecting; eye 5,  $2\frac{7}{8}$  in snout,  $2\frac{1}{2}$  in interorbital; mouth width  $2\frac{7}{8}$  in head, but very slightly arched; teeth pointed in both sexes, more so in male than in female; nostrils rather large, internarial 3 in head, broad flap at each mouth corner with hind edge fringed; preoral length  $1\frac{1}{2}$  in head; interorbital  $1\frac{1}{10}$ , cartilaginous firm region wide as orbit length. Spiracle large, oblique, close behind eye, slightly less than eye.

Curved spine in front and behind each orbit; 4 to 6 similar spines in triangle in middle of back; tail with median series of 16 to 18 spines, only very small ones on sides; these spines present in both sexes, young and old; in male greater part of body above smooth, with usual patch of recurved spines near pectoral angle; in female whole upper surface covered with scattered, small, stellate asperities, still more numerous in young; caudal series of spines in young usually continued forward to dorsal spines.

Dorsals close together, posterior little larger,  $2\frac{7}{8}$  in head, interdorsal narrow notch; pectorals form rhomboid disk, front edges

undulate, outer and hind angles obtusely rounded; ventrals notched, hind section broad.

Above brown, with rounded darker and lighter ill-defined spots. Yellowish ocellus, little larger than orbit, edged with blackish, on each side of median line in male. Length, 445 mm. (Günther.)

Kerguelen Island. Only known from the types, 2 adults and 3 young, obtained by the *Challenger* Expedition.

#### RAJA PLUTONIA Garman

*Raia plutonia* GARMAN, Bull. Mus. Comp. Zool., vol. 8, p. 236, 1881 (type locality: Off South Carolina); Mem. Mus. Comp. Zool., vol. 36, p. 335, pl. 18, fig. 1, 1913 (lat.  $31^{\circ}57' N.$ , long.  $78^{\circ}18'35'' W.$ , in 333 fathoms).—BARNARD, Ann. South African Mus., vol. 21, p. 68, 1925 (off Cape Point and south of Agulhas Bank, 450–560 fathoms).

*Raia albalinea* VONBONDE and SWART, Marine Biol. Surv. South Africa Rep., pt. 5, p. 6, pl. 20, fig. 1, 1923 (type locality: South Africa, in 280–600 fathoms).

Head to spiracle 8 in total length; disk width  $1\frac{1}{10}$  in its length, which  $1\frac{1}{5}$  in rest of body. Snout  $1\frac{1}{5}$  in head to spiracle, angle broadly obtuse; eye 3 in head to spiracle,  $2\frac{1}{5}$  in snout, 2 in interorbital; mouth slightly undulate, width little less than half preoral length; teeth in numerous rows, small, slightly spinose; outer nostril edges fringed, flaps over mouth corners slight and unfringed; interorbital  $1\frac{1}{2}$  in head to spiracle, flat. Spiracle close behind eye, oblique, length  $1\frac{1}{3}$  in eye.

Disk and sides of tail covered with spines; 2 spines before and 2 or 3 larger behind orbit; median series of large spines behind head extend on tail to first dorsal; each shoulder with group of 2 or 3 spines; no spines between dorsals; under surface smooth.

Second dorsal much larger than first, about 2 in snout, interdorsal narrow notch; caudal shorter than first dorsal; pectorals form subcircular disk, front margins slightly undulate, outer angles and hind margins very rounded and arclike.

Brown to light brown above, with irregular transverse white reticulations, on tail forming irregular white blotches. Under surface cream colored. Length, 165 mm. (Von Bonde and Swart.)

South Africa. Also off east coast of North America in the Atlantic. I follow Barnard in placing *Raia albalinea* with this species. He gives its length to 250 mm.

#### RAJA SIBOGAE Weber

*Raja sibogae* WEBER, Siboga Exped., vol. 57, Fische, p. 600, fig. 122, 1913 (type locality: Bali Sea, in 289 m.).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference).

Head to spiracle  $6\frac{2}{3}$  in total length; disk length  $1\frac{1}{5}$  in its width,  $1\frac{1}{5}$  in tail. Snout to orbit  $1\frac{1}{5}$  in head to spiracle, little exserted in

broad triangular point; orbit  $3\frac{1}{3}$ ,  $2\frac{1}{3}$  in snout,  $1\frac{7}{8}$  in interorbital; middle of jaws arched, 36 rows of teeth above, and 28 below, conic; interorbital  $1\frac{1}{4}$  in snout to orbit, concave. Spiracles little inclined, close behind orbit, half of orbit.

Upper surface of disk covered with small spines, absent above ventrals and each side of back posteriorly, also outer broad pectoral borders; row of larger thorns along each inner edge of orbit; row of 5 vertebral thorns medially over branchial region; at front of each pectoral band of large thorns, also oval group on outer postero-median portion of each pectoral, all these areas nearly twice length of orbit; tail above with many irregular rows of thorns; entire lower surface smooth.

Dorsals and caudal continuous basally, former two separated by narrow notch, subequal,  $1\frac{3}{4}$  in snout to orbit; caudal low fold but little over half dorsal; pectorals form rhomboidal disk, front edges undulate, outer and hind angles broadly convex.

Brown above, with indistinct, darker, rounded blotches. Under surface white. Length, 314 mm. (Weber.)

Bali Sea. Described from a male said to suggest *Raia andamanica* Lloyd, known from a female.

#### **RAJA LINTEA Fries**

*Raja lintea* FRIES, Vet. Akad. Handl. Stockholm, 1838, p. 154 (type locality: Sweden).

*Raia lintea* GARMAN, Mem. Mus. Comp. Zool. vol. 36, p. 329, 1913 (northern Europe).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 72, 1925 (west coast off Cape Peninsula, in 200–300 fathoms).

Width only little greater than body length, equals space from snout end not quite to end of ventrals. Snout produced, pointed, tip acute, front margin slightly undulate; rostral cartilages united about half their length; eye less than interorbital, which 4 in snout; teeth in female in 60 rows with very small points; internasal twice distance of nostril from snout tip.

Upper surface with stellate-rooted asperities and small hooked spines over snout, front edges and hind parts of pectoral; groups of slightly larger spines in front of and behind orbits, on and before suprascapular region and in about 5 irregular rows down back, continued along tail to dorsal fin; sides of tail closely set with smaller spines; lower surface with minute asperities on snout.

Outer pectoral angle broadly rounded, hind edge convex.

Uniform brownish gray, light beneath. Length, 740 mm. (Barnard.)

West coast of South Africa. Also North Atlantic. Barnard's record on a single female.

## RAJA BATIS Linnaeus

*Raja batis* LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 231, 1758 (type locality: European Ocean).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Italy).—NORMAN, Discovery Rep., vol. 12, p. 39, 1935 (off Cape Point, in 100 fathoms).

*Raia batis* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 331, 1913 (coasts of Europe).—THOMPSON, Marine Biol. Rep. South Africa, No. 2, p. 156, 1914.—BARNARD, Ann. South African Mus., vol. 21, p. 70, pl. 4, fig. 3, 1925 (False Bay and off Cape Point, in 34 to 100 fathoms).

*Dasybatis batis* BONAPARTE, Cat. Metod. Pesci. Europei, p. 13, 1846 (Atlantie).

*Raia machuelo* OSBECK, Nova Act. Acad. Leopold. Carol., vol. 4, pp. 99, 104, 1770 (type locality: Spain).

*Raja osbeckii* WALBAUM, Artedi Pisc., vol. 3, p. 532, 1792 (on Osbeck).

*Raja hispanica* SCHNEIDER, Syst. Ichth. Bloch, p. 369, 1801 (on Osbeck).

*Raia gaimardi* VALENCIENNES, Voy. Island Grönland, Gaimard, Poiss., without text, pls. 2-3, 1847 (no type locality given).

*Raja leiobatos* GRAY, Cat. fish Gronow, p. 10, 1854 (type locality: Oceano Septentrionali).

? *Raja chinensis* BASILEWSKY, Nouv. Mém. Soc. Nat. Moscou, vol. 10, p. 251, 1855 (type locality: Oriental Sea, Pekin, China).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 356, 1913 (copied).

*Raja chinensis* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference); Hong Kong Nat., vol. 1, p. 137, 1930 (compiled).

Snout  $1\frac{1}{3}$  in head; mouth width  $2\frac{1}{10}$ ; teeth above 48, below 45; preoral length  $1\frac{2}{5}$  in head; internarial  $2\frac{3}{4}$ ; interorbital  $4\frac{1}{10}$ .

Body largely smooth above; series of spines externally to pectoral tip to ventral; single small vertebral spine behind pharynx; series of median obsolete tail spines above; snout tip slightly rough above, below largely rough; body otherwise smooth.

Dorsals 2, well separated, first dorsal length 3 in head; no caudal; lateral tail folds well developed; front ventral edge  $1\frac{1}{3}$ .

Pores to ducts of lorenzini dusky.

South Africa, also in the East Atlantic.

*Raia machuelo* Osbeck is noticed with oblong body, except caudal. Head rough, partly rounded, oval. Eyes oblong. Upper jaw long. Teeth acute, wide. Nostril large. Body finely rough. Pectorals form rhomboid disk. Brown above, white to pink white below. Length, 305 mm. or more.

The imperfectly noticed *Raja chinensis* Basilewsky is said to be near this species. The following are the few fragments of its description:

Snout long, pointed. Jaw teeth small, robust, smooth. Head rough above; under edge and ends of pectorals for outer third with pointed, curved spines; back with single obtuse scute. Caudal fleshy, partly compressed, with obtuse scutes anteriorly, acute behind; small dorsals; caudal small; at base ventrals fleshy, notched, shorter than disk. Gray above, white below. Length, 509 mm.

1 example. A.N.S.P. Italy. C. L. Bonaparte. Length, 390 mm.; width 250 mm.

## RAJA NAEVUS Müller and Henle

*Raja naevus* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 138 (type locality: Atlantic coasts of Europe, Mediterranean Sea); p. 194, 1841 (note).

*Raia naevus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 321, 1913 (Atlantic and Mediterranean coasts of Europe).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 72, 1925 (west coast, off Cape Peninsula and Saldanha Bay, 100–200 fathoms).

Width little greater than space from snout end to ends of ventrals. Snout somewhat obtuse, short, only slightly produced; rostral cartilages united about half their length; eye less than interorbital, which little over 3 in preocular length; teeth 54 with short points in male; internasal less than space from nostril to snout tip.

Upper surface with small asperities on snout, front pectoral edge, and sides of tail, more numerous and widely spread in young; spines on supraorbital ridge, 1 or 2 on suprascapula, median row from occiput to dorsal, flanked on hinder part of body and on tail in larger individuals by another row, sometimes by 2 rows on tail; lower surface smooth.

Pectorals with front edges undulate, outer angles broadly rounded, hind margin convex.

Brown, uniform or chiefly in young with numerous round dark spots, of which one near pectoral base usually more prominent and larger than others, surrounded by light ring. Under surface light, with usually some irregularly shaped, but more or less symmetrically arranged, dark blotches on pectorals and ventrals. Length to 700 mm. (Barnard.)

West coast of South Africa, Atlantic and Mediterranean coasts of Europe.

## RAJA PHILIPPI Lloyd

*Raia philipi* LLOYD, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 309, 1906 (type locality: Gulf of Aden, in 130 fathoms); Rec. Indian Mus., vol. 1, p. 5, 1907 (lat.  $13^{\circ}36'00''$  N., long.  $47^{\circ}32'00''$  E., in 130 fathoms, Arabian Sea); Illustr. Zool. Investigator, Fishes, pt. 9, pls. 40, 41, fig. 1, 1908; Mem. Indian Mus., vol. 2, p. 142, 1909 (type).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 353, 1913 (compiled).

Head to spiracle  $5\frac{1}{2}$  in total; disk width  $1\frac{1}{10}$  in its length, tail  $1\frac{1}{5}$  in disk. Snout  $1\frac{1}{4}$  in head to spiracle, slender, prominent; eye  $6\frac{1}{5}$ , 5 in snout,  $2\frac{1}{4}$  in interorbital; mouth width  $2\frac{1}{8}$  in head to spiracle,  $1\frac{1}{8}$  in preoral length, which  $1\frac{1}{8}$  in head to spiracle; mouth widely angular; teeth in 80 rows above, 60 below, low, triangular, on rhomboidal base; edges of nasal valves deeply fimbriated, united across middle line by distinct fold of skin which separated from upper jaw by deep curved groove, least width of internarial  $2\frac{2}{5}$  in head to spiracle; interorbital  $2\frac{3}{5}$ , firm cartilaginous portion  $4\frac{1}{5}$ . Spiracle close behind eye, little oblique, subequal with eye.

Numerous small spinules on snout tip above and close to antero-lateral disk edge in posterior half only; 4 thorns before and 3 behind eye; row of 5 median vertebral spines over branchial region; between ocellus and pectoral edge group of lanceolate denticles pointing inward; whole lower surface of snout covered with fine denticles; 3 somewhat irregular rows of spines on tail above and its sides spiny, below smooth.

Hind dorsal little larger,  $2\frac{3}{4}$  in snout, interdorsal  $\frac{7}{8}$  first dorsal length; caudal small, low; pectorals form rhomboidal disk, front edges slightly undulate, lateral and hind angles broadly rounded.

Uniform brown above, with dark ocellus surrounded by paler ring at postero-median base of each pectoral. Uniform white below, tail dark mottled below. Length, 360 mm., male. (Lloyd.)

Gulf of Aden. Lloyd suggests *Raia powelli* may be the female; also a female from Travancore appears intermediate.

#### RAJA POWELLI ALCOCK

*Raja powelli* ALCOCK, Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 145, 1898 (type locality: Gulf of Martaban, Burma, in 67 fathoms); Illustr. Zool. *Investigator*, pt. 6, pl. 26, fig. 4, 1899; Cat. Deep Sea Fishes Indian Mus., p. 20, 1899 (type).

*Raja powellii* ANNANDALE, Mem. Indian Mus., vol. 2, p. 16, 1909 (off Trivandrum, west coast of India).

*Raia powelli* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 353, 1913 (copied).

*Raiia powelli* PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 352, 1929 (Travancore).

Head to spiracle  $5\frac{2}{3}$  in total length; disk length  $1\frac{1}{5}$  in its width, tail about  $1\frac{1}{5}$  in disk length. Snout  $1\frac{1}{5}$  in head to spiracle, rather slender, much exserted; eye  $6\frac{1}{4}$ ,  $5\frac{1}{5}$  in snout, 3 in interorbital; mouth straight; teeth in 55 rows in either jaw in female, obtusely pointed or obscurely tricuspid; preoral length nearly half again as much as outer internarial; interorbital  $2\frac{1}{5}$  in head to spiracle, firm cartilaginous interspace 4. Spiracles large, close behind eye, oblique, equal orbit.

Disk surfaces smooth except prickles near snout edge, and edge of anterior half of pectoral fin; 2 or 3 spines on front edge of orbit, 1 behind orbit; row of 3 vertebral spines at nape; 2 or 3 rows of spines extend from hind fourth of disk to first dorsal, each side of tail thorny; short series of thorns in interdorsal.

Second dorsal little larger than first,  $3\frac{3}{4}$  in head to spiracle, interdorsal  $1\frac{1}{2}$  in second dorsal; caudal small, low; pectorals form rhomboid disk, front edges broadly sinuous, outer and hind angles broadly rounded.

Above warm brown, with pair of large ocelli, one at each postero-median part of pectoral base. Lower surface dirty white. Length, 318 mm. (Alcock.)

India.

## RAJA OCULATA Risso

*Raia oculata* Risso, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 149, 1826 (type locality: Nice).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 319, 1913 (off southern England and France).—VONBONDE and SWART, Marine Biol. Surv. South Africa Rep., pt. 3, 1922, p. 4, 1924 (compiled).

*Raja maculata* (not Shaw 1803) MONTAGU, Mem. Werner Soc., vol. 2, p. 426, 1811–1816 (type locality: "South coast of Devonshire").—BONAPARTE, Cat. Metod. Pesci Europei, p. 13, 1846 (Atlantic, Mediterranean).

*Raia maculata* BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 71, 1925 (compiled).

*Raia brachyura* LAFONT, Act. Soc. Linn. Bordeaux, vol. 28, p. 503, pl. 25, 1871 (type locality: "Des côtes de la Gironde").

*Raja brachyura* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Mediterranean).

*Raia blanda* HOLT and CALDERWOOD, Trans. Roy. Dublin Soc., new ser., vol. 5, p. 395, 1895 (type locality: West coast of Ireland).

*Raja montagui* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 468 (on *Raia maculata* Montagu).—NORMAN, Discovery Rep., vol. 12, p. 46, 1935 (note).

Depth  $1\frac{1}{2}$  to end of tail; head to first gill opening 5. Snout  $1\frac{1}{3}$  in head, tip slightly protruded and rounded; eye  $8\frac{3}{4}$ ,  $6\frac{1}{3}$  in snout, 4 in interorbital; mouth width about 2 in head, apparently little curved; teeth in 88 rows above, about 86 below, each tooth with rather strong point; internasal  $3\frac{1}{5}$  in head; interorbital  $2\frac{1}{5}$ , firm cartilaginous interorbital 4, deeply concave. Second and third gill openings longest, subequal with eye.

Upper surfaces all finely asperous; 4 small spines before each eye; median, vertebral series of dorsal spines, from close behind spiracles, most developed on tail; incomplete lateral row of few spines on each side of tail irregularly, of 10 spines on left side and 7 on right side; space above each ventral laterally on disk smooth; also front lobe of ventral; lower surface of disk largely smooth, broad medial area with scattered asperities, also under surface of tail more or less roughened.

First dorsal fin little shorter than second or  $2\frac{1}{4}$  in snout; no caudal; tail  $1\frac{1}{2}$  in disk length; pectorals form rhomboid disk, slightly shorter than wide, with front edges undulate and hind edges slightly convex; front ventral lobe  $1\frac{1}{2}$  in snout.

Above dull brown, with numerous close-set, rounded, darker brown spots, all smaller than interspaces. Below uniformly pale.

South Africa. Also in the Atlantic and Mediterranean.

A.N.S.P. No. 17366. Mediterranean. C. L. Bonaparte. No. 76. Dr. T. B. Wilson. Length, 1,095 mm. Dried skin.

## RAJA QUADRIMACULATA Risso

*Raia quadrinaculata* Risso, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 150, 1826 (type locality: Nice).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 323, 1913 (coasts of Europe and Madeira).—VONBONDE and SWART, Marine

Biol. Surv. South Africa Rep., pt. 5, p. 5, 1924 (South Africa, 205 fathoms).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 70, 1925 (west coast South Africa, Cape Peninsula, Saldanha Bay, 100–250 fathoms).

*Raja quadrimaculata* BONAPARTE, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 3, descr., pl. fig. (2 males), 1833 (Italy); Cat. Metod. Pesci Europei, p. 14, 1846 (Mediterranean).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 471 (Bonaparte material).

*Raja falsarvula* BONAPARTE, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 26, descr., pl. fig. 1, 1836 (type locality: Italy).

*Raia spinosa* YARRELL, British fishes, ed. 2, vol. 2, p. 574, 1841 (type locality: North of Ireland; Dublin Bay).

*Raja circularis* MALM, Öfv. Vet.-Akad. Förh., Stockholm, 1857, p. 187 (Sweden).

Snout  $1\frac{5}{8}$  in head; mouth width  $2\frac{1}{10}$ ; upper teeth 40 to 43, below 42 or 43; preoral  $1\frac{1}{2}$ ; internarial  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; interorbital  $5\frac{1}{3}$  to 6.

Male with patch of recurved spines on head near disk margin opposite eyes. Smaller spines or asperities before and one behind, obsolete toward pectoral tips. On back medianly close behind eyes 2 spines, 3 before and 3 behind eye, and series of depressible ones on each pectoral externally. On back of tail traces of 3 series of spines.

First dorsal length  $2\frac{4}{5}$  to  $2\frac{7}{8}$  in head; front ventral edge  $1\frac{5}{8}$  to  $1\frac{3}{4}$ .

South Africa. Also East Atlantic.

2 examples, A. N. S. P. Italy. C. L. Bonaparte No. 221. Length, 330–518 mm., width 225–231 mm.

#### RAJA ANDAMANICA Lloyd

*Raia andamanica* LLOYD, Mem. Indian Mus., vol. 2, p. 140, 1909 (type locality: Andaman Sea, in 279 fathoms); Illustr. Zool. Investigator, Fishes, pl. 46, fig. 2, 1909 (type).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 352, 1913 (compiled).

Head to spiracle  $6\frac{1}{4}$  in total; width  $1\frac{1}{6}$  its length which  $1\frac{1}{6}$  in rest of body. Snout  $1\frac{1}{5}$  in head to spiracle, projects very slightly, would form obtuse angle; eye 5 in head to spiracle,  $3\frac{3}{4}$  in snout,  $2\frac{1}{3}$  in interorbital; mouth nearly transverse line, very slightly curved,  $\frac{1}{3}$  of snout; 54 rows of teeth above, 40 below, bases oval, front ones worn flat, back ones with low pointed cusp; front limit of nostril removed from mouth corner by space equal to mouth breadth; interorbital  $2\frac{1}{8}$  in head to spiracle. Spiracle close behind eye, diameter about half of eye.

About 15 large spines over rostral cartilage, not quite reaching end of disk; continuous row of 8 large thorns on supraorbital ridge, first before eye, last behind eye; single row of large spines in mid-dorsal line from short space behind spiracles to tail where less regular; rest of upper surface mostly, except posterolateral margins of pectorals, covered with small denticles; sides and top of tail spiny, spines larger

on upper surface; entire lower surface smooth and naked, except terminal half of tail, which bears few very small spines.

Dorsals small, anterior somewhat larger than posterior (figure shows reverse), close to end of tail and separated by space less than base of either; caudal narrow fold of skin on lower side of tail; pectorals form rhomboidal disk, front edges undulate, lateral and hind angles evenly rounded.

Uniform slate gray above and below. Length, 210 mm. (Lloyd.)  
Andaman Sea. Known only from the type in the Indian Museum.

**RAJA LEOPARDUS** Von Bonde and Swart

*Raja leopardus* VON BONDE and SWART, Marine Surv. South Africa Rep., pt. 5, p. 7, pl. 20, fig. 2, 1923 (type locality: Natal coast in 40–280 fathoms).—

BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 74, 1925 (Natal coast).

*Raja leopardus* NORMAN, Discovery Rep., vol. 12, p. 35 (lat. 34°8' S., long 17°33' E., in 402?–548 m.), p. 44 (off Dassen Island, Table Bay, Cape Point; Natal; type), 1935.

Head to spiracle  $7\frac{1}{4}$  to tip of tail; disk length  $2\frac{1}{5}$ , length  $1\frac{1}{10}$  its width. Snout  $1\frac{1}{3}$  in head to spiracle, projects in rounded point forming obtuse angle; eye  $5\frac{1}{2}$  in head to spiracle, 4 in snout, 3 in interorbital; mouth nearly straight, with angle in middle toward snout, width 2 in preoral length, interorbital  $1\frac{2}{3}$  in head to spiracle, flat. Spiracles oblique, close behind orbit, long as eye.

Whole disk, excluding ventrals, covered with small spines, extending to end of tail, except median line which occupied by row of large vertebral spines from shoulder to first dorsal; small spines more densely strewn along front edges, rostrum, interorbital and sides of median line from head to tail; sparsely covered or almost smooth patches on either side of tail root and 2 areas anterior to suprascapular regions just behind head; also 2 before and 2 behind eye along orbital ridge; 2 suprascapular spines each side of disk center; no median spines between dorsals.

Dorsals and caudal continuous along shallow fold, subequal, about long as orbit; pectorals form subcircular disk, front margins slightly curved outward and slight concavities in margins either side of front end of rostrum, outer angles and hind edges and angles broadly rounded in wide curve; ventrals notched about half their length, oblong posteriorly and bluntly pointed either side of tail.

Dusky brown, with numerous distinct very dark brown, nearly black spots, varying in size from large, oval, oblong, and circular about size of eye on tail to smaller, more evenly circular and numerous spots on disk and along edges of margins; whole effect resembles appearance of leopard skin. With age color of background and spots fade, then dirty dusky yellow tinged with brown; spots less intense, far between, smaller and less well marked; tail well marked with

smaller and larger spots; dorsals and caudal stained black, except hind free edges, which brown; lower surface unmarked and with ordinary pale yellow color. Length, 247 mm. (Von Bonde and Swart.) Natal.

#### RAJA NITIDA Günther

*Raja nitida* GÜNTHER, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 27, pl. 14, fig. a, 1880 (type locality: Off Twofold Bay, New South Wales, in 120 fathoms).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 9, p. 63, 1884 (Twofold Bay, in 120 fathoms).—MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 10, fig. 3 (mouth), 1911 (Bass Straits and Victoria); Fishes of New South Wales, ed. 2, p. 11, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 500, 1930 (reference).

*Raia nitida* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 363, 1913 (compiled).

Head to spiracle  $5\frac{3}{4}$  in total length; disk length  $1\frac{1}{10}$  in its width, tail about  $1\frac{1}{3}$  in disk length. Snout  $1\frac{1}{3}$  in head to spiracle, tip very thin median papillary projection, forms broadly obtuse angle; eye  $3\frac{1}{4}$  in head,  $2\frac{1}{3}$  in snout,  $1\frac{2}{3}$  in interorbital; teeth with very small points, nearly obtuse; internarial between outer nostril edges less than their distance from snout tip; interorbital  $2\frac{1}{4}$  in head to spiracle, firm cartilaginous interspace less than orbit. Spiracle close behind eye,  $1\frac{1}{3}$  in eye.

All upper parts covered with minute asperities; 1 or 2 curved spines in front and behind orbit; 1 in middle of back and series along median line of tail to dorsals.

Dorsals close together, interspace nearly  $\frac{2}{5}$  base of first which larger or  $3\frac{1}{5}$  in head to spiracle; pectorals form rounded disk, front edge very slightly undulate, outer and hind edges and angles rather evenly to obtusely convex; ventral deeply notched, broad behind.

Above light brown, marbled with dark brown, dark brown blotches ornamented by small, round, yellowish ocelli. Length, 204 mm. (Günther.) Victoria, New South Wales.

#### RAJA POROSA Günther

*Raja porosa* GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 154, 1874 (type locality: Chefoo).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo, Korea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 501, 1930 (reference); Hong Kong Nat., vol. 1, p. 135, 1930 (compiled).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 266, fig. 23, 1932 (Chusan).—WANG, Contrib. Biol. Lab. Sci. Soc. China, vol. 9, p. 104, 1933 (Chusan).—IKEDA, Hakubutugaku Zassi, vol. 35, p. 582, 1927 (Momotori-Mura).

*Raia porosa* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 350, 1913 (China).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 160, pl. 5, fig. 15, 1932 (tooth) (Tsingtao).

? *Dasybatis undulata* (not Lacépède) BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 120, 1874 (Chinese drawing).

Front part of snout abruptly contracted into narrow thin appendage; disk width much more than distance from snout end to hind margin of ventral fin. Teeth in 54 or 56 series above, pointed in male, flat in female; interorbital more than  $\frac{1}{3}$  in snout.

Superciliary margin with a series of spines; rostral process with small stellate asperities; series of 3 or 4 spines in median line of back behind head; tail with 3 series of spines in male, 5 in female. Male with band of hooks near pectoral angle and again on each side of head and front disk edge covered with asperities on upper side in whole length. Female smooth on parts just noted, but provided with broad band of small hooks along upper side of posterior margin.

Pectorals forming anterior profile undulated.

Upper parts brown, snout white. Lower parts whitish, tinged with brown. Skin of lower part of snout and throat perforated with numerous large pores, white in center and surrounded by black ring. Width, 110 mm. (Günther.)

Northern Chefoo. Günther's description based on a male and a female.

#### RAJA SPINACIDERMIS Barnard

*Raja spinacidermis* BARNARD, Ann. South African Mus., vol. 13, pt. 8, p. 440, 1923

(type locality: South Africa); vol. 21, pt. 1, p. 73, pl. 4, fig. 6, 1925 (South Africa, probably off Cape Point in deep water).

*Raja spinacidermis* NORMAN, Discovery Rep., vol. 12, p. 46, 1935 (type).

Head to spiracle  $4\frac{1}{10}$  in total length; disk length  $1\frac{1}{3}$  in its width, tail  $1\frac{2}{5}$  in disk length. Snout  $1\frac{1}{4}$  in head to spiracle, pointed but little produced, rostral cartilages narrow and slender, united little over half their length; eye 6,  $4\frac{7}{8}$  in snout,  $2\frac{2}{5}$  in interorbital; teeth in 60 rows, median ones slightly pointed; internarial less than distance of nostril from snout tip; interorbital  $2\frac{2}{5}$  in head to spiracle, firm cartilaginous interspace 4. Spiracles little oblique, close behind eye.

Whole upper surface of disk and upper and lateral surfaces of tail covered with closely set fine, setiform spinules, resembling skin of *Spinax*, larger and closer on tail than elsewhere; large spines entirely absent; lower surface of snout tip with few spinelets; lower surface of tail, except median line of basal  $\frac{2}{3}$ , with setiform spinules similar to those on upper surface.

Dorsals small, separated, about 4 in head to spiracle; pectorals form rhomboid disk, front edge nearly straight, outer angle broadly rounded, hind edge convex.

Pale slatey gray, becomes slightly darker toward inner margins of pectorals, distinctly darker on ventrals. Lower surface similarly and as deeply colored as upper surface. Reaches 600 mm. (Barnard.)

South Africa. Known only from a female, possibly a sexual variation of *Raja microps* Günther, which Barnard considers it.

The following species of the North Pacific are listed here for completeness:

#### **RAJA ALEUTICA** Gilbert

*Raja aleutica* GILBERT, Rep. U. S. Fish Comm., pt. 11 (1893), p. 397, pl. 21, 1895  
(type locality: Station 3257, north of Sannak Pass, Aleutian Islands, depth 81 fathoms).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 75, 1896 (Unalaska).—EVERMANN and GOLDSBOROUGH, Bull. Bur. Fisheries, vol. 26 (1906), p. 230, 1907 (Alaska).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 22, 1930 (Far East Seas).

*Raia aleutica* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 343, 1913 (off Aleutian Islands).

Localities: Kamchatka, Aleutians, Alaska.

#### **RAJA BINOCULATA** Girard

*Raja binoculata* GIRARD, Proc. Acad. Nat. Sci. Philadelphia, 1854, p. 196 (type locality: San Francisco).—JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 878, 1883 (compiled).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 72, 1896 (Monterey to Sitka).—SCHMIDT, Fishes western seas Russia, p. 291, 1904 (Korsakowsk at Saghalin).—EVERMANN and GOLDSBOROUGH, Bull. Bur. Fisheries, vol. 26 (1906), p. 229, 1907 (Alaska localities).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 470 (Pacific Grove, Calif.).—BERG, Faune Russie, Poiss., vol. 1, p. 90, 1911 (Korsakowsk).—JORDAN, TANAKA, and SNYDER, Journ. College Sci. Tokyo, vol. 33, p. 28, 1913 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1920, p. 400 (California materials); 1923, p. 279 (Vancouver, British Columbia; Seattle, Wash.), p. 283 (San Francisco), p. 295 (La Jolla, Calif.).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 19, 1930 (Far East Seas).

*Raia binoculata* BEAN, Proc. U. S. Nat. Mus., vol. 4, p. 260, 1882 (Sitka; Port Althorp; St. Paul; Kadiak).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 346, 1913 (California northward).

*Uroptera binoculata* GIRARD, Rep. Pacific R. R. Surv., Fish, pt. 10, p. 373, 1858 (San Francisco; Presidio, Calif.).

*Raja cooperi* GIRARD, op. cit., p. 372 (type locality: Sand flats near the entrance of Shoalwater Bay).—JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 42, 1883 (Monterey to Sitka).

Snout  $1\frac{1}{7}$  to  $1\frac{1}{4}$  in head; interorbital 4 to  $4\frac{3}{4}$ ; mouth width  $2\frac{2}{7}$  to  $2\frac{3}{5}$ ; internasal  $2\frac{3}{4}$  to  $2\frac{7}{8}$ ; snout tip to mandible  $1\frac{1}{6}$  to  $1\frac{2}{7}$ ; first dorsal length  $3\frac{1}{8}$  to  $4\frac{1}{2}$ ; front ventral edge  $1\frac{5}{6}$  to  $2\frac{1}{10}$ ; teeth above 40 to 44, below 36 to 43; eye socket  $1\frac{1}{2}$  to  $1\frac{3}{4}$  in interorbital.

In male disk widest slightly after middle in its length, front profiles well undulated, and snout tip not extremely tapering. Interorbital concave. Eye shorter than spiracle. Mouth little curved. Teeth acute. Body smooth above, except minute asperities on rostral cartilages, preocular, vertebral column just after pharynx and opposite ventral bases, and along front pectoral margins and lower snout surface. Median series of spines on back begins over hind

basal region of ventral. About 4 small spines above eyes and 2 above left spiracle. Series of depressible spines externally on each pectoral. Color in alcohol dull chocolate brown above. Several obscure dusky blotches at each pectoral base. Below whitish, ducts of lorenzini ending in dusky pores. Narrow lateral cutaneous fold along tail. Dorsals 2, separated, second continuous basally with caudal fold.

Female with disk widest well after middle of its length, front profiles scarcely undulated. Snout pointed. Mouth straight. Teeth rather acute. Minute asperities similar to but smaller than in male, more numerous on head posteriorly, over greater pectoral area and lower region of back. No depressible pectoral spines. On back just after pharynx 2 vertebral spines. Over eye 4 spines, none over spiracle. An obscure lateral series of spines, besides enlarged median series.

Saghalin, Korsakowsk, Alaska, British Columbia, Washington, Oregon, California. Description above from specimens from Pacific Grove, Calif., in A. N. S. P.

#### RAJA INTERRUPTA Gill and Townsend

*Raja interrupta* GILL and TOWNSEND, Proc. Biol. Soc. Washington, vol. 11, p. 232, 1897 (type locality: Bering Sea).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 345, 1913 (copied).

*Raja interrupta* JORDAN and EVERMANN, U. S. Nat. Mus., Bull. 47, pt. 3, p. 2751, 1898 (compiled).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 22, 1930 (Far East Seas).

Localities: Far East Seas, Bering Sea.

#### RAJA PARMIFERA Bean

*Raja parmifera* BEAN, Proc. U. S. Nat. Mus., vol. 4, p. 157, 1882 (type locality: Iliuliuk, Unalaska).—JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 878, 1883 (copied).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 345, 1913 (Unalaska).

*Raja parmifera* GILBERT, Rep. U. S. Fish Comm., pt. 19 (1893), p. 395, 1895 (Bristol Bay, Alaska).—JORDAN and EVERMANN, U. S. Nat. Mus., Bull. 47 pt. 1, p. 74, 1896 (copied).—EVERMANN and GOLDSBOROUGH, Bull. Bur. Fisher., vol. 26 (1906), p. 230, 1907 (Frederick Sound; Shelikof Strait; Chignik Bay; Alitak Bay, Alaska).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 21, 1930 (Far East Seas).—TARANETZ, Bull. Associate Acad. Sci. S. S. R., No. 13, pp. 90, 91, 1935 (note); Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 51, 1937.

Localities: Far East Seas, Alaska.

#### RAJA ROSISPINIS Gill and Townsend

*Raja rosispinis* GILL and TOWNSEND, Proc. Biol. Soc. Washington, vol. 11, p. 231, 1897 (type locality: Bering Sea).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 345, 1913 (copied).

*Raja rosispinis* JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 3, p. 2751, 1898 (copied).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 22, 1930 (Far East Seas).—TARANETZ, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 51, 1937.

*Raja obtusa* GILL and TOWNSEND, Proc. Biol. Soc. Washington, vol. 11, p. 231, 1897 (type locality: Bering Sea).

Localities: Far East Seas, Bering Sea.

#### RAJA VIOLENCEA Suvorov

*Raja violacea* Suvorov, Bull. Acad. Sci. Leningrad, vol. 3, p. 433, fig. 1, 1935 (type locality: Okhotsk Sea).—TARANETZ, Bull. Associate Acad. Sci. S. S. R., No. 13, pp. 90, 99, 1935 (“Described on two specimens probably belonging to different species”); Bull. Pac. Sci. Inst. Fisher. Oceanogr., vol. 2, p. 50, 1937.

Locality: Okhotsk Sea.

#### Genus PSAMMOBATIS Günther

*Psammobatis* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 470, 1870. (Type, *Psammobatis rufis* GÜNTHER, monotypic.) (*Psammobates* FITZINGER 1835 in reptiles not involved.)

*Malacorhina* GARMAN, Proc. Boston Soc. Nat. Hist., vol. 19, 1877, p. 203, 1878. (Type, *Raja mira* Garman, monotypic.)

*Irolita* WHITLEY, Rec. Australian Mus., vol. 18, p. 97, 1931. (Type, *Raja waitii* McCULLOCH, orthotypic.)

Disk circular. Tail depressed, with fold on each side. Snout very short, overlapped by front portions of pectoral fins, which form foremost part of disk. Teeth obtuse. Each nostril with 2 nasal valves, anterior forming sort of tube, posterior triangular. Two small dorsals near end of tail, latter without distinct terminal fin. Each ventral divided by deep notch, front part narrow and enveloped in very loose skin.

#### PSAMMOBATIS WAITII (McCULLOCH)

*Raja waitii* McCULLOCH, Zool. Res. Endeavour, vol. 1, p. 12, pl. 3, text fig. 4 (ventral view), 1911 (type locality: Northwest of Greenly Island, South Australia, in 44 fathoms).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr. Java, p. 500, 1930 (reference).

*Psammobatis waitii* WAITE, Rec. South Australian Mus., vol. 2, p. 30, fig. 43, 1921. *Irolita waitii* WHITLEY, Rec. Australian Mus., vol. 18, p. 97, 1931 (reference).

Head to first gill opening  $4\frac{3}{4}$  in total length; disk length  $1\frac{1}{16}$  in its width, tail  $1\frac{1}{2}$  in disk length. Snout  $1\frac{2}{5}$  in head to spiracle, broadly rounded, with median rounded papilla; eye  $4\frac{2}{3}$ ,  $3\frac{3}{4}$  in snout,  $3\frac{1}{5}$  in interorbital; mouth width  $2\frac{1}{2}$  in head to first gill opening; teeth small, rounded, scarcely juxtaposed, each with small median point; nostrils with raised tubular margin, forming lobe posteriorly; nasal lobes extended back and out, outer edges truncate, posterior sinuate, internarial  $2\frac{3}{5}$  in head to first gill opening; preoral length  $1\frac{5}{6}$ ; interorbital  $1\frac{7}{8}$  in head to spiracle. Gill openings gradually

smaller to posterior, first rather more than half width of spiracle. Spiracle oblique, equals eye.

Disk smooth above except 2 pairs of spines above front part of eyes and 4 over posterior portions; several minute spines on upper eyelid; tail with several rows of spines, largest anteriorly, most numerous posteriorly; both dorsals covered with minute spines.

Dorsals subequal, interspace about half base length, first dorsal 3 in head to spiracle; no caudal; pectorals form circular disk, edges all rounded; front ventral lobes well extended.

Pale brown above with lighter patches covered with small brown dots. Body, fins, and tail with numerous small bluish spots, absent only on lighter patches of disk. In places bluish spots confluent and form reticulations. Lower surfaces slate colored. Length, 454 mm. (McCulloch.)

South Australia, Southwest Australia.

### Family DASYATIDAE

Body, head, and pectorals depressed, forming wide disk. Tail distinct from disk, narrow and tapering, usually with serrated spine. Mouth transverse, more or less curved. Teeth small, in quincunx, tessellated. Front nasal valves confluent across narrow isthmus, reaching mouth. Gill openings narrow. Spiracles large, close behind eyes. Front copula of hypobranchial cartilages segmented. Skin smooth or rough with spines or tubercles, or both. Pectorals meet in front of cranium, forming snout without supporting rostral cartilages. Ventrals small, below pectorals.

A large family with many species, living mostly in the seas and rivers of subtropical or tropical countries. They are generally found in bays, lagoons, or inlets in shallow water. As they conceal their bodies by burying in the mud or sand leaving only their eyes and spiracles free, they are a scourge to the unwary bather or fisherman, for should one be trodden on it immediately darts its murderous caudal spine into the foot or leg of its victim, inflicting painful or even mortal wounds. Sting rays are said to fling their tails around fishes they attack for food, piercing or tearing at them with the deadly caudal spine, much the same as they would try to defend themselves from a powerful enemy.

#### ANALYSIS OF GENERA

*a<sup>1</sup>*. DASYATINAE. Disk about wide as long.

*b<sup>1</sup>*. Tail long and whiplike.

*c<sup>1</sup>*. Tail with serrated spine.

*d<sup>1</sup>*. Disk oval; tail compressed----- *Taeniura*

*d<sup>2</sup>*. Disk quadrangular; tail filamentary----- *Dasyatis*

*e<sup>2</sup>*. Tail without serrated spine; disk circular----- *Urogymnus*

*b<sup>2</sup>*. Tail moderate or short.

*c<sup>1</sup>*. Caudal fin present.

*f<sup>1</sup>*. Tail with serrated spine..... *Urolophus*

*f<sup>2</sup>*. Tail without serrated spine..... *Anacanthobatis*

*c<sup>2</sup>*. No caudal fin..... *Urolophoides*

*a<sup>2</sup>*. GYMNURINAE. Disk broader than long; tail short..... *Gymnura*

### Genus TAENIURA Müller and Henle

*Taeniura* MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 117. (Atypic: Type, *Trygon ornatum* Gray); Arch. Naturg., 1837, p. 400. (Type, *Trygon ornatum* Gray, virtually orthotypic.)

*Trygon* (not Cuvier) GEOFFROY SAINT-HILAIRE, Deser. Egypte, Poiss., pl. 25, 1817. (Type, *Raja lymma* Forskål, monotypic.)

*Alexandrinum* MOLIN, Sitz. Ber. Akad. Wiss. Wien., math.-nat. Kl., vol. 42, p. 579, 1861 (Atypic: Type, *Alexandrinum molini* Zigno).—ZIGNO, Reale Inst. Veneto, vol. 8, p. 299, 1874. (Type, *Alexandrinum molini* Zigno=*Raja muricata* Volta, 1796.)

*Discotrygon* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 468. (Type, *Discobatis marginipinnis* MacLay and Macleay, orthotypic.)

*Taeniurus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 399, 1913. (Type, *Taeniura meyeni* Müller and Henle.)

Disk rounded. Tail longer than body, with spine above, in front of middle of length. No rostral cartilage. Mouth small, with papillae, velum fringed. Teeth small, tessellate, grooved transversely. Front nasal valves confluent, with free lateral and hind edges, median attachment narrow. Cranium prominent, fontanel broad and rounded in front of skull, narrow between orbits. No dorsal. Subcaudal rayless below terminal end of tail. Pectorals meet in front of skull. Ventrals elongate, front rays longer than posterior.

The following species, insufficiently described, appears to approach *Taeniura meyeni*:

#### TAENIURA GRABATA (Geoffroy Saint-Hilaire)

*Trygon grabatus* GOEFFROY SAINT-HILAIRE, Deser. Egypte, Poiss., vol. 1, p. 218, pl. 25, figs. 1-2, 1809; p. 232, 1827 (type locality: Red Sea).

*Trygon grabata* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 484, 1870 (copied).

*Taeniura grabata* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 172, 1841 (Alexandria).—GRAY, List fish British Museum, p. 125, 1851 (copied).

*Taeniura grabatus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 621, 1865 (compiled).

Head to hind spiracle edge  $5\frac{1}{2}$  in total length. Snout  $1\frac{1}{2}$  in head to hind spiracle edge, front edge as seen above broadly convex; eye 13, 9 in snout,  $5\frac{3}{4}$  in interorbital; interorbital  $2\frac{1}{4}$  in head to hind spiracle edge. Spiracle large, close behind eye, 3 times long as eye and interspiracle space  $2\frac{1}{10}$  in head.

Skin smooth, except few asperites along side of tail before caudal spine and back to its tip (shown on figure).

Tail  $1\frac{3}{5}$  in disk length, with caudal fold beginning under caudal spine insertion and extending to tail tip; caudal spine 2 in head to hind spiracle edge; pectorals form circular disk, which slightly broader than long; ventrals obtuse, extend little below hind disk edge.

Above uniform. (Geoffroy Saint-Hilaire.)

Günther says "upper surface covered with minute spines with a radiated base." According to Duméril reddish gray above, white below. Disk 1,117 mm., tail 865 mm.

#### ANALYSIS OF SPECIES

*a<sup>1</sup>.* Mouth curved; 2 oral papillae; skin smooth in young, medianly little rough with age; grayish, with rounded, dark-edged blue or black spots— *lymma*

*a<sup>2</sup>.* Mouth straight; 5 oral papillae; skin smooth; blackish brown— *meyeni*

#### TAENIURA LYMMA (Forskål)

*Raja lymma* FORSKÅL, Descript. Animal., pp. VIII, IX, 1775 (type locality: Lohaja, Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1511, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 533, 1792 (copied).—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 119, pl. 4, figs. 2–3, 1798 ("îles de Praslin, Cayenne, Asie, Afrique, Amérique").

*Raia lymnia* BONNATERRE, Tableau encyclop., Ichth., p. 5, 1788 (Red Sea).

*Raja lymna* SCHNEIDER, Syst. Ichth. Bloch, p. 365, 1801 (Red Sea).

*Raia lymna* CUVIER, Régne animal, vol. 2, p. 137, 1817 (reference).

*Trygon lymma* GEOFFROY SAINT-HILAIRE, Descr. Egypte, Poiss., pl. 27, fig. 1, 1818 (Red Sea).

*Trygon lymna* CLOQUET, Dict. Sci. Nat., vol. 38, p. 62, 1825.

*Trigon lymna* RÜPPELL, Atlas Reise nördl. Afrika, Fische, p. 51, pl. 13, fig. 1, 1828 (Red Sea); Neue Wirbelth., Fische, p. 69, pl. 19, fig. 4, 1835 (reference).

*Taeniura lymma* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 171, pl. 55, fig. 3, 1841 (India, Red Sea, Timor, New Ireland).—GRAY, List fish British Mus., p. 124, 1851 (Red Sea, Singapore).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 78, 1852 (Batavia, Singapore); Nat. Tijdschr. Nederland. Indië, vol. 3, p. (54) 85 (Singapore, Batavia), p. 546, 1852 (Amboina); Verh. Batav. Genootsch. (Plagiost.), vol. 25, p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 7, p. 228, 1854 (Macassar); vol. 12, p. 194 (Ternate), p. 218, 1856 (Nias); Act. Soc. Sci. Indo-Néerl., vol. 1, No. 3, p. 6, 1856 (Manado); vol. 1, No. 5, p. 8, 1856 (Amboina); vol. 2, No. 7, p. 9, 1857 (Ambolina); Nat. Tijdschr. Nederland. Indië, vol. 13, p. 389, 1857 (Timor, Koepang); vol. 15, p. 243, 1858 (Singapore); Nederland. Tijdschr. Dierk., vol. 1, p. 160, 1863 (Morotai, Halmahera).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 619, 1865 (Red Sea, types of *Trygon halgani*).—MARTENS, Verh. zool.-bot. Ges. Wien, vol. 16, p. 379, 1866 (Red Sea).—GÜNTHER, Fishes of Zanzibar, p. 143, 1866 (Aden, Zanzibar, Mozambique); Cat. Fishes British Mus., vol. 8, p. 483, 1870 (Red Sea, Zanzibar, Singapore, East Indies, Ceram).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 241, 1871 (Red Sea).—GÜNTHER, in Brenchley's Cruise of *Curaçoa*, p. 409, 1873 (Solomon Islands).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Kandavu).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Singapore).—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 64, 1879 (Kandavu).—KÁROLI, Termesz. Füzetek, Budapest, vol. 5, p. 148, 1881 (Singapore; Sarawak).—

MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 598, 1883 (New Guinea).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 10, p. 465, 1885 (Cape York); Cat. Fishes Australian Mus., pt. 1, p. 20, 1888 (South East New Guinea).—FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 241, 1907 (Padang).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 473 (Padang example).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 495, 1910 (New Mecklenberg, Solomons, Admiralty Islands).—OGILBY, Mem. Queensland Mus., vol. 1, p. 21, 1912 (Darnley Island).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 399, pl. 53, fig. 4, pl. 55, fig. 7, pl. 71, figs. 4–5, 1913 (Red Sea, Singapore, Mauritius, Fiji).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 604, 1913 (Saleyer).—OGILBY, Mem. Queensland Mus., vol. 5, p. 87, 1916 (Green Island, Cairns, Cape York, Darnley Island).—MCCULLOCH, Rec. Australian Mus., vol. 13, pt. 2, p. 41, pl. 10, 1920 (Murray Island, Port Douglas and St. Crispin Reef, Queensland).—WHITLEY, Australian Zoologist, vol. 4, p. 228, 1926 (North West Islet, Cape York and Sir Edward Pellew Islands, Queensland).—PARADICE and WHITLEY, Mem. Queensland Mus., vol. 9, p. 78, 1927 (Pellew Group).—BARNARD, Ann. South African Mus., vol. 21, pt. 2, p. 1015, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (Port Moresby); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (Siam, East Indies, Indian Ocean); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).—HERRE, Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Sitanki; Jolo).—TORTONESE, Bol. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, No. 63, p. 12, 1935–36 (Red Sea).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Techn. Bull. 6, p. 16, 1937 (reference).—FOWLER, List Fish. Malaya, p. 18, 1938 (reference).

*Taeniura lymna* CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1412, 1849 (Pinang, Malay Peninsula, Singapore).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 60, p. 571, 1870 (Singapore).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (East Indies).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—CHABANAUD, Service Océanogr. Peches Indo-Chine, 1<sup>e</sup> note, p. 6, 1926 (Gulf of Siam).—GILTAY, Mem. Mus. Roy. Nat. Hist. Belg., ser. 5, vol. 3, p. 16, 1933 (Poeloe Endoe, Aru Islands).—SUVTATTI, Index Fish. Siam, p. 5, 1937 (Nam Chieu, Trat).

*Taeniura lijnma* BLEEKER, Nat. Tijdschr. Nederland, Indië, vol. 3, p. 740, 1852 (Macassar).

*Trygon ornatus* GRAY, Illustr. Indian Zool. Hardwicke, vol. 1, pl. 99, 1832 (type locality: Singapore). (*ornatum* in list of figures.)

*Trygon halgani* LESSON, Voy. Coquille, Zool., vol. 2, pt. 1, p. 100, pl. 3, 1830 (type locality: Offack Bay, Waigu; Port Praslin, New Ireland).—GUÉRIN, Iconogr. Poiss., pl. 69, fig. 3, 1838.

*Trygon halganii* SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 29, 1869 (Kandavu).

*Taeniura lymnia halgani* WHITLEY, Rec. Australian Mus., vol. 18, No. 3, p. 97, pl. 11, 1931 (Murray Island, Whitsunday Passage, North West Islet, Brampton Island, St. Crispin Reef, Cape York, Port Darwin, Pellew Group).

*Taeniura melanospilos* BLEEKER, Nat. Tijds. Nederland. Indië, vol. 4, p. 513, 1853 (type locality: Batavia, Java).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 620, 1865 (compiled).—SOUTHWELL, Rep. Ceylon Marine Lab., vol. 1, p. 185, 1910 (Ceylon pearl banks); Ceylon Administr. Rep., 1912–13, pp. E43, E49.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

*Taeniura melanospila* GÜNTHER, Cat. Fish. British Mus., vol. 8, p. 484, 1870 (compiled).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 682, 1871 (Red Sea).—DAY, Fishes of India, pt. 4, p. 740, 1878 (off Coromandel).—MEYER, Anal. Soc. Españ. Hist. Nat., Madrid, vol. 14, p. 49, 1885 (North Celebes and Macassar).—DAY, Fauna British India, Fishes, vol. 1, p. 56, 1889.—BOULENGER, Proc. Zool. Soc. London, 1892, p. 136 (Muscat).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 400, 1913 (copied).

*Discobatis marginipinnis* MACLAY and MACLEAY, Proc. Linn. Soc. New South Wales, vol. 10, p. 676, pl. 46, figs. 7–15, 1886 (type locality: Pacific Ocean near Admiralty Islands; on specimen with mutilated tail from Sorry or Wild Island).

*Discotrygon marginipinnis* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 462 (on Maclay and Macleay).

Depth 13 to 13½ to end of tail; head 6; disk width  $1\frac{1}{10}$  to  $1\frac{1}{8}$  in its length, which  $1\frac{1}{6}$  in tail. Snout  $1\frac{1}{3}$  to  $1\frac{1}{2}$  in head, front profile as seen from above convex; eye 5 to  $5\frac{1}{4}$ ,  $3\frac{1}{2}$  in snout,  $3\frac{1}{4}$  to  $3\frac{1}{2}$  in interorbital; dentary width  $3\frac{1}{3}$  to  $3\frac{7}{8}$  in head,  $1\frac{1}{4}$  in inter-narial width; teeth in 15 to 24 rows in jaws, convex, rhombic; nostrils simple deep pits, edges entire; interorbital  $1\frac{2}{3}$  to  $2\frac{2}{5}$  in head, depressed medianly, each eye bulging little upward. Gill openings moderate, equidistant, last smallest. Spiracles large, deep, larger than eye, edges entire.

Skin smooth in young, variably larger examples roughened with some fine asperities near middle of disk. On trunk median row of small vertebral tubercles. Tail with 1 to 2 spines in large examples of which posterior longer or about long as snout.

No dorsal; anal as wide fold inferiorly on tail, its depth greater than tail depth; pectorals form subcircular disk, outer edges broadly convex; ventrals partly triangular elongate, ends in rather wide points.

Back gray-brown, disk paler marginally and including pectorals and ventrals, marked with small dark blue or slate blue spots, largest on head medially and about pectoral bases but becoming numerous and smaller as if crowded about outer portions of disk. With age spots greatly more numerous, especially submarginal small ones. None of spots extend on tail, which has blue superolateral longitudinal line each side. Under surface of body whitish. Anal dusky marginally, brownish basally.

Red Sea, Arabia, Zanzibar, Mozambique, Mauritius, Malay Peninsula, Singapore, East Indies, Philippines, Siam, Queensland, Melanesia, Polynesia. A handsome species easily known by its ornate coloration. Garman describes the body as smooth, though with age my examples show some roughness.

8432. Cebu market. March 24, 1909. Length, 440 mm.

5187. Jolo market. March 7, 1908. Length, 360 mm. to end of broken tail.

A1412. Tampotana Island. December 31, 1909. Length, 472 mm.

7669. Ulugan Bay, Palawan Island. December 28, 1908. Length, 500 mm.  
 U.S.N.M. No. 47611. Red Sea. Gleu Island New York Museum. Length, 280 mm.  
 U.S.N.M. No. 49326. Massaua, Red Sea. Milan Museum. Length, 345 mm.  
 U.S.N.M. No. 58008. Zamboanga. Dr. E. A. Mearns. Length, 725 mm. Tail cut in half, with 2 spines.  
 U.S.N.M. No. 39975. Port Moresby, New Guinea. Australian Museum. Length, 585 mm.  
 1 example. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. M. Hiller. Length, 405 mm. In arrack pale olivaceous brown above, darker or dusky down disk center and tail above. Disk above marked everywhere with large deep ultramarine blue spots varying up to eye in size and irregularly distributed. Tail above with 2 longitudinal narrow blue bands along each side from junction with disk till opposite lower caudal lobe base. Disk edges above somewhat soiled buff brown. Disk below white, edges or borders similar to those above, same also of ventrals. Tail dirty white below. Lower caudal lobe blackish.

#### TAENIURA MEYENI Müller and Henle

*Taeniura meyeni* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 172, pl. 1841 (type locality: Mauritius).—GRAY, List fish British Museum, p. 124, 1851 (Cape Upstart, Queensland).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 620, 1865 (type).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 483, 1870 (copied).—SAUVAGE, Hist. Nat. Madagascar, Poiss., pp. 5, 510, 1891.—PEARSON, Ceylon Administr. Rep., p. E13, 1912-13.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 400, 1913 (Mauritius).—WHITLEY, Rec. Australian Mus., vol. 18, p. 99, 1931 (reference).

Head to hind spiracle edge  $6\frac{1}{2}$  to caudal tip. Snout  $1\frac{1}{2}$  in head to hind spiracle edge; eye  $4\frac{3}{4}$ , eye  $4\frac{3}{5}$  in snout,  $2\frac{1}{2}$  in interorbital; mouth straight, width  $1\frac{1}{2}$  in internarial or  $2\frac{1}{6}$  in preoral length; about 28 lower rows of teeth each with transverse groove; interorbital  $1\frac{3}{4}$  in head to hind spiracle edge. Spiracle close behind and slightly less than eye, interspiracle space  $1\frac{2}{3}$  in head to hind spiracle edge.

Skin smooth.

Tail with low keel above near end; subcaudal extends over great part of tail terminally, equally deep medially as terminally; pectorals form nearly circular disk, which little broader than long, subequal with tail.

Blackish brown above. Below white, pectorals and ventrals with blackish edges. (Müller and Henle.)

Mauritius, Ceylon. According to Duméril the type is 480 mm. long.

#### Genus DASYATIS Rafinesque

*Dasyatis* RAFINESQUE, Caratteri animali piante Sicilia, p. 16, 1810. (Type, *Dasyatis ujo* Rafinesque, monotypic.)

*Dasybatus* (Klein) WALBAUM, Artedi Pisc., vol. 3, p. 581, 1792. [Atypic; type, *Raja pastinaca* Linnaeus, designated by Jordan, Proc. U. S. Nat. Mus., vol. 4, p. 35, 1881 (inadmissible).]

- Dasibatis* AGASSIZ, Nomencl. Zool. Pisces, p. 21, 1845.—(Garman) JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 65, 1883. (Type, *Raja pastinaca* Linnaeus.)
- Uroxys* RAFINESQUE, Indice d'ittiologia siciliana, p. 48, 1810. (Type, *Dasyatis ujo* Rafinesque, virtual monotype.)
- Trygonobatus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816. (Type, *Trygonobatus vulgaris* Blainville= *Raja pastinaca* Linnaeus, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 94, 1917.)
- Trygonobatis* BLAINVILLE, Faune Française, Poiss., p. 35, 1825. (Type, *Raja pastinaca* Linnaeus.)
- Trygon* (Adanson) CUVIER, Règne animal, vol. 2, p. 136, 1817. (Type, *Raja pastinaca* Linnaeus, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 98, 1917.)
- Pastinachus* RÜPPELL, Atlas Reise nördl. Afrika, Fische, p. 82, 1828. (Type, *Raja sephen* Forskål.)
- Pastinaca* SWAINSON, Nat. Hist. Animals, Fishes, vol. 1, p. 172, 1838. (Type, *Raja sephen* Forskål.)
- Pastinacha* SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, pp. 192, 319, 1839. (Type, *Pastinacha olivacea* Swainson= *Raja pastinaca* Linnaeus, virtually tautotypic.)
- Himantura* MÜLLER and HENLE, Arch. Naturg., p. 400, 1837. (Atypic; type, *Raja uarnak* Forskål, designated by Garman, Mem. Mus. Comp. Zool., vol. 36, p. 375, 1913.)
- Himanturus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 375 (392), 1913. (Type, *Raja uarnak* Forskål.)
- Hypolophus* MÜLLER and HENLE, Arch Naturg., p. 400, 1837. (Atypic; type, *Raja sephen* Forskål, selected as example by Bonaparte, Ann. Sci. Nat., Bologna, vol. 2, p. 202, 1838.)
- Hemitrygon* MÜLLER and HENLE, Mag. Nat. Hist., vol. 2, p. 90, 1838. (Type, *Trygon bennetti* Müller and Henle, monotypic.)
- Heliobatis* MARSH, Amer. Journ. Sci. Arts, ser. 3, vol. 14, p. 256, 1877. (Type, *Heliobatis radians* Marsh, monotypic.) (Fossil.)
- Xiphotrygon* COPE, Amer. Nat., vol. 13, p. 333, 1879. (Type, *Xiphotrygon acutidens* Cope, monotypic.)
- Brachioptera* GRATZIANOW, Zool. Anz., 1906, p. 400. (Type, *Brachioptera rhinoceros* Gratzianow, monotypic.)
- Pteroplatytrygon* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, 474. (Type, *Trygon violaceum* Bonaparte, orthotypic.)
- Amphotistius* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 375 (392), 1913. (Type, *Trygon sabina* Lesueur, orthotypic.)
- Toshia* WHITLEY, Rec. Australian Mus., vol. 19, No. 1, p. 60, 1933. (Type, *Dasyatis fluviorum* Ogilby, orthotypic.)
- Bathytoshia* WHITLEY, op. cit., p. 61. (Type, *Dasyatis thetidis* Whitley, orthotypic.)

Disk partly quadrangular to partly circular. Tail elongate, whip-like, with serrated caudal spine, with or without dermal fin folds behind spine and without lateral folds on base. No rostral cartilages supporting snout. Front copula of branchihyal cartilages segmented. Skin smooth or with spines and tubercles. No rayed dorsal fins. Pectorals wanting in front of skull.

The following species is known only from the original imperfect figure of Müller and Henle:

## DASYATIS PURPUREUS (Müller and Henle)

*Trygon purpurea* (Andrew Smith) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 160, pl. 52, 1841 [no locality (probably South Africa, on drawing by Sir Andrew Smith.)]—GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 472, 1870 (reference).

*Trygon (Himantura) purpureus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 593, 1865 (compiled).

*Dasybatis purpurea* BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 78, 1925 (on original figure of Müller and Henle).

*Dasybatis purpurea* BARNARD, Ann. Mag. Nat. Hist., ser. 10, vol. 13, p. 229, 1934 (Kalk Bay; False Bay, South Africa).

Head very small,  $1\frac{3}{4}$  in total length. Snout 2 in head to hind spiracle edge, as seen above forms widely obtuse angle; eye very small, 5 in head, 2 in snout,  $2\frac{1}{2}$  in interorbital; mouth width large; preoral length  $1\frac{1}{2}$  in mouth width; about 26 rows of upper teeth; internarial slightly greater than preoral length or  $1\frac{1}{3}$  in mouth width, edge of each flap entire; interorbital  $1\frac{2}{3}$  in head to hind spiracle edge. Spiracle small, close behind eye, slightly larger than eye, interspiracle width  $2\frac{1}{5}$  in head.

Skin smooth.

Tail little shorter than disk length, tapering, spine (one figure shows 2 spines) midway in tail length,  $5\frac{1}{2}$  in disk length; pectorals form broad rhomboid disk, front edges but very slightly sinuous, outer angles convex; ventrals obtusely rounded.

Above dark blue to violet, below somewhat clearer blue. Size not given, length of larger figure 285 mm. (Müller and Henle.)

## ANALYSIS OF SPECIES

a<sup>1</sup>. HIMANTURA. Tail without keels or folds; disk broader than long; tubercles depressed in pavement.

b<sup>1</sup>. Tail 3 times body or more.

c<sup>1</sup>. Oral papillae 4 to 7.

d<sup>1</sup>. Brown, with dark spots, tail banded----- uarnak

d<sup>2</sup>. Brown, with lighter spots, tail banded----- gerrardi

c<sup>2</sup>. Oral papillae 2; brown, tail without bands----- bleekeri

b<sup>2</sup>. Tail twice length of body or more.

e<sup>1</sup>. Oral papillae 7; reddish-brown spots, more or less reticulate.

krempfi

c<sup>2</sup>. Oral papillae 4; brown, with paler spots, snout pointed---- alcockii

e<sup>2</sup>. Oral papillae 2; brown, with yellow reticulations---- favus

a<sup>2</sup>. PASTINACHUS. Cutaneous fold on tail below, none above; disk broader than long; tubercles rounded, stellate.

f<sup>1</sup>. Tail 3 times disk length; snout sharp; oral papillae 5; scales tessellated; brown----- bennettii

f<sup>2</sup>. Tail more than twice to nearly 3 times disk length.

g<sup>1</sup>. Oral papillae 5.

h<sup>1</sup>. Brown, uniform or irregularly spotted white---- latus

h<sup>2</sup>. Brown, tail blackish----- sephen

g<sup>2</sup>. Oral papillae 4; brown, tail blackish----- gruveli

- f<sup>3</sup>.* Tail  $1\frac{1}{3}$  times disk length; oral papillae 9; bluish slate.  
*agulhensis*
- f<sup>4</sup>.* Tail once disk length.
- i<sup>1</sup>.* Oral papillae 5; 7 median spines on back; greenish-slate  
 above\_\_\_\_\_  
*schreineri*
- i<sup>2</sup>.* Oral papillae 3; spines stellate; slate gray, spotted with  
 white\_\_\_\_\_  
*brevicaudatus*
- a<sup>3</sup>.* **DASYATIS.** A cutaneous fold below tail, keel above; disk broader than long;  
 oral papillae 5; body smooth; tail  $1\frac{1}{2}$  body lengths; brown, greenish to  
 olive or grayish, with or without pale spots\_\_\_\_\_  
*pastinacus*
- a<sup>4</sup>.* **AMPHOTISTIUS.** A cutaneous fold below tail and another above; disk broader  
 than long.
- j<sup>1</sup>.* No larger tubercles in vertebral row\_\_\_\_\_  
*sinensis*
- j<sup>2</sup>.* Tubercles in vertebral row narrow, depressed.
- k<sup>1</sup>.* Tail little over 2 disk lengths.
- l<sup>1</sup>.* Back rough, with median row of tubercles; oral papil-  
 lae 7; brown, olivaceous\_\_\_\_\_  
*fluviorum*
- l<sup>2</sup>.* Body smooth, only tail roughened terminally; oral  
 papillae 7; gray, with irregular blackish margins.  
*ushiei*
- k<sup>2</sup>.* Tail equals 2 disk lengths.
- m<sup>1</sup>.* Oral papillae 3; median row of tubercles; above  
 chocolate brown\_\_\_\_\_  
*navaruae*
- m<sup>2</sup>.* Oral papillae 2; brown, with black-edged blue  
 spots\_\_\_\_\_  
*kuhlii*
- k<sup>3</sup>.* Tail less than 2 disk lengths.
- n<sup>1</sup>.* Oral papillae 5; back smooth to rough, tubercles  
 broad based in vertebral and scapular rows;  
 brown olive to grayish\_\_\_\_\_  
*brevis*
- n<sup>2</sup>.* Oral papillae 3; back roughened, tubercles ver-  
 tebral and humeral; brown, uniform to clouded.  
*akajei*
- n<sup>3</sup>.* No oral papillae; back smooth to rough, tubercles  
 in median row large; brown, yellowish to red-  
 dish\_\_\_\_\_  
*zugei*
- k<sup>4</sup>.* Tail once or more length of body.
- o<sup>1</sup>.* Oral papillae 5; tubercles with stellate bases;  
 white, tail gray brown\_\_\_\_\_  
*microps*
- o<sup>2</sup>.* Oral papillae 4.
- p<sup>1</sup>.* Olive, tail gray; snout pointed; tubercles  
 rounded\_\_\_\_\_  
*jenkinsii*
- p<sup>2</sup>.* Coloration uniform\_\_\_\_\_  
*ponapensis*
- o<sup>3</sup>.* Oral papillae 3\_\_\_\_\_  
*ulylenburgi*
- o<sup>4</sup>.* Oral papillae 2.
- q<sup>1</sup>.* Gray with blackish margins\_\_\_\_\_  
*marginatus*
- q<sup>2</sup>.* Reddish brown, yellow spotted.  
*imbricatus*
- q<sup>3</sup>.* Brown, with 9 ill-defined, crescentic,  
 brownish markings arched along middle  
 of each pectoral\_\_\_\_\_  
*granulatus*

Subgenus *HIMANTURA* Müller and Henle*DASYATIS UARNAK* (Forskål)

*Raja uarnak* FORSKÅL, Descript. Animal., pp. VIII, 18, 1775 (type locality: Arabia).—GMELIN, Syst. Nat. Linn. vol. 1, p. 1509, 1789 (copied).—WALBAUM, Artedi Pisc., vol. 3, p. 534, 1792 (copied).

*Raja arnak* FORSKÅL, Descript. Animal., p. IX, 1775 (Lohaja; Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1512, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 536, 1792 (copied).—SCHNEIDER, Syst. Ichth. Bloch, p. 364, 1801 (Red Sea).

*Raia uarnac* CUVIER, Règne animal, vol. 2, p. 136, 1817 (reference).

*Trygon uarnak* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 158, 1841 (Indian Ocean and Red Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1405, 1849 (Pinang, Malay Peninsula, Singapore).—GRAY, List fish British Museum, p. 116, 1851 (Red Sea; Madras).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 69, 1852 (Batavia); (Bengal), vol. 25, p. 16 (on *Trygon russellii* Gray), p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 8, p. 393, 1855 (Amboina); vol. 21, p. 58, 1860 (Cape of Good Hope).—BLYTH, Journ. Asiat. Soc. Bengal, vol. 29, p. 44, 1860 (Calcutta).—DAY, Fishes of Malabar, p. 277, 1865.—BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 276, 1868 (Batjan).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 473, 1870 (Red Sea, Zanzibar, Seychelles, Madras, Pinang, India, East Indies).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 679, 1871 (Red Sea).—PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 553 (New Ireland).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 407, 1876 (Bangkok).—DAY, Fishes of India, pt. 4, p. 737, pl. 194, fig. 1, 1878.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 366, 1878 (Port Darwin); vol. 5, p. 313, 1880 (Port Darwin); vol. 6, p. 377, 1881 (Port Darwin); vol. 8, p. 212, 1883 (Lower Burdekin River, Queensland).—BOULENGER, Proc. Zool. Soc. London, 1887, p. 667 (Muscat).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 19, 1888 (Burdekin River, Maryborough, Port Essington; Malabar).—DAY, Fauna British India, Fishes, vol. 1, p. 53, 1889.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Buntal).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 193, 1904 ("Sungai Batu"? Banda, Maharami).—STEINDACHNER, Denkschr. Akad. Wiss. Wien. math.-nat. Kl., vol. 71, pt. 1, p. 160, 1907 (Scheich Othman and Kor Garrich).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 240, 1907 (Palembang).—LLOYD, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 22, fig. 2, pl. 1, figs. 1-2, pl. 2, figs. 1-1a, pl. 3, fig. 2, 1909 (Bengal Bay).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 402, 1910 (Samoa).—PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 4, 1912 (Singapore).—ZWAAN, Durch Zentral-Sumatra, vol. 2, p. —, 1912 (Taluk, Sumatra).—PEARSON, Ceylon Administr. Rep. 1912-13, p. E 13.—SOUTHWELL, Ceylon Administr. Rep. 1912-13, pp. E 43, E 44.—ZUGMAYER, Abh. Bayer. Akad. Wiss., math. phys. Kl., vol. 26, p. 8, 1913 (Oman).—WEBER, Siboga Exped., vol. 57, Fische, p. 602, 1913 (Tamil Djampeah, Makassar, Saleyer).—PEARSON, Ceylon Administr. Rep., 1914, p. E 4; 1915-18, p. F 12.—BAMBER, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Sudanese Red Sea).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 3, p. 287, 1916 (reference).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, pp. 77, 175, 1929 (Cochin China).

*Trygon uarnack* RICHARDSON, Ichth. China Japan, p. 197, 1846 (Sea of China, Indian Ocean, Red Sea, Cape of Good Hope).

- Trygon (Himantura) uarnak* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 585, 1865  
 (Red Sea, Malabar, Seychelles, Tourane, Cochinchina, Dorey, New Guinea).
- Trygon narnak* WEBER, Zool. Ergebn. Reise Niederländ. Ost Indien, p. 458, 1894  
 (Borneo, Banka, Java, Ternate, in fresh water).
- Pastinachus uarnak* RÜPPELL, Neue Wirbelth., Fische, p. 69, pl. 19, fig. 2, 1835.
- Leiobatus uarnak* BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 264, 1863  
 (Atapupu, Timor).
- Himantura uarnak* SAUVAOE, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27 (1907), p. 235, 1908 (Manila).—OGILBY, Mem. Queensland Mus., vol. 5, p. 88, 1916 (Moreton Bay, Platypus Bay, Pine Peak, Burdekin River, Goode Island).—MC CULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, July 7, p. 130, 1925 (reference).—MC CULLOCH, Fishes of New South Wales, ed. 2, p. 12, fig. 38 a, 1927.—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 17, 1937 (reference).
- Himantura arnake* McCULLOCH, Austral. Mus. Mem., vol. 5, p. 29, 1929 (North Australia; Queensland; New South Wales).
- Dasybatis uarnak* REGAN, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Durban Bay, Natal).—ROBINSON, Natal Fisher. Rep., p. 51, 1919.—BARNARD, Ann. South African Mus., vol. 21, p. 76, 1925.
- Dasyatis uarnak* STEAD, Additions to fish fauna New South Wales, vol. 1, p. 2, 1907 (Queensland).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 473 (Padang); vol. 79, p. 256, 1927 (Orani and Orion, Philippines); Mem. Bishop Mus., vol. 10, p. 24, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (East Indies, Philippines); Hong Kong Nat., vol. 1, p. 177, fig. 20, 1930 (East Indies, Philippines).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 109, fig. 9, 1933 (Yenting).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 364, 1935 (Durban); List Fish. Malaya, p. 17, 1938 (reference).
- Dasyatis uaranak* FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 101, 1928 (Bombay; also Philippine and Sumatran examples) (error).
- Dasybatis uarnak* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 376, 1913 (Indian Ocean, Red Sea, East Indies).—SUVATTI, Index Fish. Siam, p. 7, 1937 (Maenam Canthaburi; Gulf of Siam; Songkhla; Maenam Tha-ein; Packnam Wen).
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- Raja ommescherit* FORSKÅL, Descript. Animal., p. viii, 1775 (type locality: Red Sea).
- Raja tajara* FORSKÅL, Descript. Animal., p. viii, 1775 (type locality: Red Sea).
- Raja schoukie* FORSKÅL, Descript. Animal., p. viii, 1775 (type locality: Red Sea).
- Raja mula* FORSKÅL, Descript. Animal., p. viii, 1775 (type locality: Red Sea).
- Raja uarnata* WALBAUM, Artedi Pisc., vol. 3, p. 713, 1792 (on Forskål).
- Raja tafara* WALBAUM, Artedi Pisc., vol. 3, p. 713, 1792 (on Forskål).
- Trygonobatus longicaudatus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816 (name only).
- ? *Trygonobatus russellianus* BLAINVILLE, Bull. Soc. Philomath. Paris, vol. 8, p. 112, 1816 (name only).
- ? *Trygonobatus sindrachus* BLAINVILLE, Bull. Soc. Philomath. Paris, vol. 8, p. 112, 1816 (name only).
- Trygon chindrakec* (Cuvier) BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (on Tenkee shindraki Russell, Fishes of Coromandel, vol. 1, p. 3, pl. 5, 1803, type locality: Vizagapatam).

- Trygonobatus russellii* GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 100, 1832-34 (type locality: India).
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- Dasyatis russellii* FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 499, 1904 (Padang examples).
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- Trygon (Himantura) variegatus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 587, 1865 (copied).
- Trygon undulata* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 70, 1852 (type locality: Batavia, Samarang); Nat. Tijdschr. Nederland. Indië, vol. 8, p. (152) 167, 1855 (Bandjermassing, Batavia, Samarang).
- Trygon (Himantura) undulatus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 586, 1865 (Malabar).
- Trygon maculata* (Kuhl and Van Hasselt) BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 70, 1852 (name in synonymy).
- Trygon pareh* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 71, 1852 (type locality: Batavia); Nat. Tijdschr. Nederland. Indië, vol. 5, p. (428) 461, 1853 (Pengaron, Borneo; Batavia).
- Trygon semirugosa* (Kuhl and Van Hasselt) BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 71, 1852 (name in synonymy).
- Trygon uarnacoides* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 72, 1852 (type locality: Batavia, Samarang); Nat. Tijdschr. Nederland. Indië, vol. 3, p. (717) 738, 1852 (Pankalpinang, Banka; Java); vol. 7, p. 314, 1854 (Bantem); Act. Soc. Sci. Indo-Néerl., vol. 2, No. 7, p. 9, 1857 (Amboina); Nederland. Tijdschr. Dierk., vol. 1, p. 73, 1863 (Banka).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 588, 1912 (Batavia).
- Trygon acuta* (Kuhl and Van Hasselt) BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 72, 1852 (name in synonymy).
- Trygon pastinacoides* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 75, 1852 (type locality: Batavia).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 588, 1912 (Batavia).
- Trygon ellioti* BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 41, 1860 (type locality: Lower Bengal).
- Trygon punctata* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 474, 1870 (type locality: East Indian Archipelago ?).—BARTLETT, Sarawak Gaz., vol. 26, No. 366, p. 134, 1896 (Buntal).
- Trygon (Himantura) oxyrhynchus* SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 2, p. 94, 1878 (type locality: Saigon, Cochinchina).
- Himantura gerrardi* (not Gray) TOSII, Marine Biol. Rep. Queensland, p. 4, pl. 5, fig. 2, 1903 (Goode Island).

Depth  $16\frac{3}{5}$  to  $23\frac{3}{4}$  to end of tail; head 6 to  $10\frac{1}{5}$ ; disk about long as wide, its length  $1\frac{3}{5}$  to  $2\frac{3}{5}$  in tail. Snout  $1\frac{1}{3}$  to  $1\frac{2}{3}$  in head, forms short median point of blunt wide angle; eye  $5\frac{1}{2}$  to 8 in head, 4 to  $5\frac{1}{3}$  in snout,  $2\frac{3}{4}$  to  $4\frac{7}{8}$  in interorbital; dentary width  $3\frac{3}{5}$  to 4 in head, waved; teeth in 25 to 38 rows in jaws; nostrils simple pits, internasal little broader than dentary width; interorbital  $1\frac{1}{2}$  to  $2\frac{1}{5}$

in head, nearly level. Gill openings moderate, equidistant, last smallest. Spiracle large, deep, little larger than eye, edges entire.

Skin largely smooth. Spine  $1\frac{1}{8}$  in interspiracle. A few fine asperities on occiput. Large median white tubercle in center of disk, surrounded by many smaller close-set flattened ones in form of rhomb.

Dorsal and anal absent; tail very long and tapering; pectorals form broad rhomboid disk, hind edges very slightly convex; ventrals triangular, rather pointed; claspers short points.

Back and upper surface of disk dark brown, below whitish. Tail dusky.

Red Sea, Arabia, Zanzibar, Natal, Cape of Good Hope, Madagascar, Seychelles, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Siam, Cochinchina, Philippines, Northern Territory Australia, Queensland, Melanesia, Polynesia. With age the middle of the back becomes studded more or less with tubercles, finally extending more or less over the head, body and tail. Garman says "the vertebral series apparently does not extend upon the tail" which is true also of my large examples as well as the small ones.

9053. Aboyog, Leyte. July 26, 1909. Length, 1,260 mm. Covered all over above with very numerous close-set dark brown spots, crowded closely, though smaller toward edges of disk.

7635. Mouth of Melampaya River. December 26, 1908. Length, 1,445 mm. Covered entirely with thick-set dark spots.

8293. Sorsogon market, Luzon. March 12, 1909. Length, 1,027 mm. Body above with small close-set dark obscure spots.

5087. Sandakan, Borneo, Dutch East Indies. March 2, 1908. Length, 675 mm. Marked with creamy spots above though larger and most conspicuous posteriorly on disk.

5109. Sandakan. March 3, 1908. Length, 910 mm.

7187. Port San Vicente. November 18, 1908. This agrees in coloration and armature with the Melampaya River specimen. Caudal spines 2, posterior  $1\frac{1}{2}$  in head.

6324. Manila market. July 11, 1908. Length, 1,490 mm.

6754. Manila market. April 20, 1909. Length, 1,690 mm. This and the preceding differ a little, though as both are males possibly sexual. Both have in addition to the large median tubercle at the center of the disk 11 or 12 forward and 4 or 5 posteriorly vertebral tubercles, all smaller. These also have a more pointed snout than the others of large size and the dark spots are much more indistinct or less defined, also apparently less numerous.

U.S.N.M. No. 39983. Maryborough, Queensland. Australian Museum. Length, 1,250 mm. Body marked with close-set pale spots, intervening dark lines forming reticulations.

U.S.N.M. No. 39985. Port Essington. Australian Museum. Length, 1,040 mm.

U.S.N.M. No. 72481. Batavia, Java. Bryant and Palmer. April 2, 1909. Length, 178 mm. As *Trygon pastinacoides*. Disk entirely smooth; caudal spine  $1\frac{1}{4}$  in head or little greater than interspiracle width.

U.S.N.M. No. 72482. Batavia, Java. Bryant and Palmer. Length, 508 mm. As *Trygon uarnacoides*.

2 examples A.N.S.P. Padang, Sumatra. A. C. Harrison and H. L. Hiller. Disk 196 to 225 mm. Brown above, darker in disk center and on disk posteriorly number of round whitish spots with darker brown borders than body color. Tail basally with similar spots and most entire length with many equal whitish rings. Below white, tinted pale brown along edges.

#### DASYATIS GERRARDI (Gray)

*Trygon gerrardi* GRAY, List fish British Mus., p. 116, 1851 (type locality: India).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 474, 1870 (types: East Indies: Japan).—ELERA, Cat. Fauna Filip., vol. 1, p. 620, 1895 (Luzon, Cavite, Santa Cruz).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 240, 1907 (Priaman, Padang, Benkulen).

*Trygon gerrardii* ANNANDALE, Mem. Indian Mus., vol. 2, p. 24, pl. 2, fig. 2, pl. 3, fig. 6 (mouth), 1909 (Burma, Chittagong, Orissa).

*Leiobatis gerrardi* BLEEKER, Arch. Néerland. Sci. Nat., vol. 13, p. 26, 1878 (New Guinea).

*Himantura gerrardi* JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 42, 1901 ("Japan").

*Dasybatis gerrardi* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 377, 1913 (India, East Indies, Samoa, Zanzibar).

*Dasyatis gerrardi* FOWLER, Mem. Bishop Mus., vol. 10, p. 24, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java., p. 504, 1930 (reference); List Fish. Malaya, p. 16, 1938 (reference).

*Trygon macrurus* BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. 607, 1852 (type locality: Padang, Batavia, Samarang); Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 74, 1852 (Batavia, Samarang, Padang); Act. Soc. Sci. Ind.-Néerl. (Sumatra), vol. 8, p. 11, 1860 (Priaman); Nat. Tijdschr. Nederland. Indië, vol. 20, pp. 239, 447, 1859–60 (Singapore); Nederland. Tijdschr. Dierk., vol. 1, p. 73, 1863 (Banka).

*Trygon lioccephalus* KLUNZINGER, Verh. zool-bot. Ges. Wien, vol. 21, p. 678, 1871 (type locality: Koseir, Red Sea).

*Himantura fai* JORDAN and SEALE, Bull. Bur. Fisher., vol. 25 (1905), p. 184, fig. 2, 1906 (type locality: Apia, Samoa).

*Trygon uarnak* (part) GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 492, 1910 (on Jordan and Seale).

Head to hind spiracle edge  $1\frac{1}{2}$  in total length. Snout  $1\frac{1}{2}$  in head to hind spiracle edge, seen above meets at widely obtuse angle, not projecting; orbit 5,  $3\frac{1}{3}$  in snout,  $3\frac{1}{4}$  in interorbital; mouth width  $1\frac{3}{4}$  in snout; teeth in about 13 upper rows, 23 below; interorbital  $1\frac{1}{2}$  in head. Spiracle close behind eye, subequal.

Seven small spines, close-set vertebral row over last half of branchial area above center of disk; few scattered minute asperities scarcely showing through skin near vertebral spines and on interorbital, otherwise disk entirely smooth. Upper surface of tail with scattered small asperities.

Tail long, whiplike, without any folds (spine removed); disk subquadrangular, length  $1\frac{1}{5}$  in its width or  $2\frac{9}{10}$  in tail, front edges slightly sinuous, outer angles broadly rounded, hind edges convex with ends obtuse.

Above drab brown, uniform, top of tail dusky. Under surface of disk uniform white and under surface of tail light brown.

Red Sea, Zanzibar, India, East Indies, Japan, Polynesia. Also reported from the Philippines by Elera. According to Garman possibly a variety of *Dasyatis uarnak*.

U.S.N.M. No. 51712. Apia, Samoa. Bureau of Fisheries. Length, 1,195 mm. Type of *Himantura fai*.

#### DASYATIS BLEEKERI (Blyth)

*Trygon bleekeri* BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 41, 1860 (type locality: Bengal).—DUMÉRIL Hist. Nat. Elasmobr., vol. 1, p. 593, 1865 (copied).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 475, 1870 (copied).—DAY, Fishes of India, pt. 4, p. 738, pl. 195, fig. 3, 1878; Fauna British India, Fishes, vol. 1, p. 54, 1889.—ANNANDALE, Mem. Indian Mus., vol. 2, p. 26, pl. 3, fig. 9 (mouth), 1909 (off Burma and Orissa).—PEARSON, Ceylon Administr. Rep., 1915–18, p. F14.—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 173, 1923 (Nontaburi); Mem. Roy. Asiatic Soc. Bengal, vol. 6, p. 464, 1924 (Tale Sap, Outer Lake).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> Note, p. 175, 1929 (Cochin China).—SUWATTI, Index Fish. Siam, p. 5, 1937 (reference).

*Dasybatus bleekeri* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 379, 1913 (compiled).—SUWATTI, Index Fish. Siam, p. 6, 1937 (Ko Yai; Kwae Yai).

*Dasybatus (Himanturus) bleekeri* CHEVEY, Inst. Océanogr. Indochine, 19<sup>e</sup> Note, p. 7, 1932 (Cochin China).

Head to hind spiracle edge  $8\frac{3}{5}$  in total length. Snout  $1\frac{1}{4}$  in head to hind spiracle edge; eye  $8\frac{3}{4}$ ,  $6\frac{1}{4}$  in snout,  $4\frac{2}{5}$  in interorbital; jaws distinctly undulated, upper medially forms narrow conical downward projection, lower with corresponding median concavity; teeth dark reddish brown, with single transverse ridge, very distinct on unworn teeth and divides as 2 equal convex surfaces marked with longitudinal corrugations; on mouth floor 2 long fingerlike processes nearer one another than either to mouth angle but rather widely separated; interorbital  $2\frac{1}{4}$  in head to hind spiracle edge. Spiracles close behind and little larger than eyes, interspace 2.

Large round tubercle in middle of back, commonly 3 smaller disposed before and 3 similarly behind. Tubercles sometimes along upper tail surface to caudal spine, with age extend to its extremity.

Tail long, whiplike, spine about first eighth of its length or  $2\frac{7}{8}$  in head to hind spiracle edge; pectorals form subrhomboidal disk, length  $2\frac{1}{3}$  in tail, width  $1\frac{1}{10}$  in its length, front edges slightly sinuous and hind and outer angles broadly rounded.

Above uniform dark brown. Ventral surface in young white, with broad dark-brown margin, with age broadens over most of disk; sometimes leaving distinct median streak which may be obscured by dark blotches or disappear. (Day, Annandale.)

India, Ceylon, Cochin China. Known by its uniform coloration above, the tail without pale rings. Blyth reported one 2,465 mm.

long. According to Garman "apparently one of the numerous varieties of *D. uarnak*."

**DASYATIS KREMPFI Chabanaud**

*Dasybatus (Himanturus) krempfi* CHABANAUD, Bull. Mus. Hist. Nat. Paris, 1923, p. 47, text fig. 2 (buccal papillae) (type locality: Pnom Penh, Cambodia); Service Océanogr. Pêches. Indo-Chine, 1<sup>e</sup> Note, p. 6, 1926 (reference).

*Dasybatus krempfi* CHABANAUD, Bull. Mus. Hist. Nat. Paris, 1923, p. 558 (Pnom Penh).

*Dasyatis krempfi* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Snout short, sharp point on front disk edge; eye somewhat prominent, nearly large as spiracle; mouth feebly incurved, upper jaw with 3 undulations; lower less so; teeth small, white, in oblique rows, with transverse keel faced behind well-marked concavity; 2 series of oral papillae, 4 in front equidistant and 3 behind; interocular width  $2\frac{3}{4}$  in snout from eye.

Skin with small polygonal scutes or more or less rounded, sparse upon snout and disk above, more numerous upon head and median region; somewhat behind center of back large rounded pearl-like scute, followed by smaller; more posteriorly series of spiniform scutes, prolonged upon tail nearly  $\frac{2}{3}$  its length, which considerably more remote than insertion of caudal spines.

Tail  $2\frac{1}{2}$  to 3 times longer than disk, armed with 2 short spines marked each side with 2 feeble grooves, below 2 other grooves deeper and approaching each other so convex space separated resembles an elevated keel; these 4 indistinct grooves at tail base well marked medianly in their length and nearly to their extremity, appearing to form above and below rudimentary cutaneous fold; pectorals form subcircular disk, somewhat longer than broad, front edges partly linear, outer angles rounded and hind angles narrowly rounded; ventrals subtriangular, outer angle moderately prolonged.

Above very pale, with reddish-brown spots, irregularly rounded, often confluent, paler in centers, compact so pale coloration gives aspect of network. Rest of tail and all body below white. Length, 655 mm. (Chabanaud.)

Indochina. Said to be near *Dasyatis imbricatus* though its coloration suggesting *Dasyatis favus*.

**DASYATIS ALCOCKII (Annandale)**

*Trygon alcockii* ANNANDALE, Mem. Indian Mus., vol. 2, p. 27, fig. 3, 1909 (type locality: Puri, Orissa coast).

*Dasybatus alcockii* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 378, 1913 (copied.)

Head to hind spiracle edge  $\frac{1}{3}$  in total length. Snout  $1\frac{1}{4}$  in head to hind spiracle edge, as seen above pointed, forming right angle;

eye small,  $9\frac{3}{4}$  in head,  $7\frac{1}{4}$  in snout, 5 in interorbital; mouth small, jaw distinctly but not strongly undulated; teeth white, with single distinct transverse ridge, larger on upper jaw at sides than in middle, not occupying whole exposed surface of either jaw; interorbital 2 in head to hind spiracle edge. Spiracles little larger than eye and farther apart or interspace  $1\frac{4}{5}$ .

Skin tough. Scales flat, more or less rounded; largest in small patch behind shoulder girdle; between eyes and on middle of hind part of back and base of tail larger than those on central part of disk, where small and deeply sunk in skin to almost invisible; tail completely covered with flat scales except ventral surface of part anterior to spine, this surface, pectoral and pelvic fins bare.

Tail nearly cylindrical but somewhat flattened above base, tapering, without cutaneous folds, with single spine equal to space across interspiracle; pectorals form quadrangular disk, its length  $1\frac{2}{3}$  in tail,  $1\frac{1}{6}$  in its width, outer angles rounded.

Above dark olive-brown, with small, obscure, pale spots scattered all over disk and base of tail. Fin edges purplish above. Dorsal and lateral surfaces of tail brown, without markings except at base. Ventral surface, including base of tail, white suffused with pink. Rather broad purplish lateral margin marbled with white. Length, about 1,983 mm. (Annandale.)

#### DASYATIS FAVUS (Annandale)

*Trygon favus* ANNANDALE, Mem. Indian Mus., vol. 2, p. 25, pl. 1, fig. 3, pl. 3, fig. 10 (mouth), 1909 (type locality: Off Orissa).

*Dasybatus favus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 377, 1913 (copied).

Head to hind spiracle edge  $7\frac{1}{2}$  in total length. Snout  $1\frac{1}{3}$  in head to hind spiracle edge, rather produced; eyes small, widely separated; mouth large; teeth white, transverse ridge feeble even on unworn teeth; on mouth floor 2 bluntly triangular processes with irregularly serrated margins and joined together by similarly serrated ridge. Spiracle large,  $5\frac{3}{5}$  in head.

Skin without denticles with stellate bases.

Tail slender, tapering (spine apparently removed in photograph, its insertion about first thirteenth in tail length); pectorals form very flat disk, broadly rounded, length  $1\frac{3}{4}$  in tail.

Dorsal surface of disk very dark brown with bold reticulation of dull yellow, becomes less regular on fore part of disk; yellow spot or streak in middle of most of meshes of reticulations. Ventral surface white. Length, 1,300 mm. across disk. (Annandale.)

India. According to Garman "apparently a variety of *D. uarnak*."

Subgenus *PASTINACHUS* Rüppell*DASYATIS BENNETTHI* (Müller and Henle)

*Trygon bennetti* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 160, pl. 52, 1841 (type locality: China and Trinidad).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 480, 1870 (China, India, British Guiana).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> Note, p. 77, 1929 (Cochinchina).

*Trygon bennetti* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, pl. 52, 1841.—RICHARDSON, Ichth. China Japan, p. 197, 1846 (China Sea).—GRAY, List fish British Museum, p. 118, 1851 (China).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 2, p. 55, 1865 (Amoy).—DAY, Fauna British India, Fishes, vol. 1, p. 52, 1889.

*Trygon bennetii* ELERA, Cat. Fauna Filip., vol. 1, p. 620, 1895 (Luzon, Manila).

*Trygon (Hemitrygon) bennetti* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 595, 1865 (no locality).

*Dasybatus bennetti* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 383, 1913 (compiled).

*Dasybatus (Pastinachus) bennetti* CHEVEY, Inst. Océanogr. Indochine, 19<sup>e</sup> Note, p. 7, 1932 (Cambodge).

*Dasyatis bennetti* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (reference).

*Dasyatis bennetti* FOWLER, Hong Kong Nat., vol. 1, p. 178, 1930 (compiled).

*Trygon carnea* RICHARDSON, Ichth. China Japan, p. 197, 1846 (type locality: China Sea, Macao).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 595, 1865 (reference).

Head to hind spiracle edge 8½ in total length. Snout 1⅔ in head to hind spiracle edge, as seen above ends in nearly even triangular point; eye 5, 3½ in snout, 2½ in interorbital; mouth width 2¾ in preoral length; internarial 2; interorbital 2 in head to hind spiracle edge. Spiracle close behind and little larger than eye, interspiracle space 1⅓.

Skin smooth in young, with age rough with pavement of scales and tubercles on middle of back and tail, asperities less close set behind caudal spine.

Tail with serrated spine about first eighth its length, long as snout; narrow fold below about long as caudal spine; pectorals form subrhomboid disk, length 2⅓ in tail, very slightly longer than wide, front edges nearly straight, outer angles and hind edges broadly rounded.

Above grayish yellow, tail darker. Below white. (Müller and Henle.)

India, China, Cochin China, Amoy. Also reported from the Philippines by Elera. Duméril gives the length of an example in the Paris Museum as 914 mm.

*DASYATIS LATUS* (Garman)

*Trygon lata* GARMAN, Bull. Mus. Comp. Zool., vol. 6, p. 170, 1880 (type locality: Hawaiian Islands).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 493, 1910 (copied).

*Dasibatis lata* (Garman) JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 67, 1883 (type).

*Dasyatis lata* JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903), p. 47, 1905 (copied).

*Dasybatus latus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 383, pl. 32, fig. 1-2, 1913 (type).

*Dasyatis latus* FOWLER, Mem. Bishop Mus., vol. 10, p. 24, 1928 (Honolulu; type of *Dasyatis sciera*) ; Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Hawaii).

*Trygon tuberculata* (not Bonnaterre) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 480, 1870 [type locality: Sydney (not American materials)].—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 378, 1881 (Port Jackson).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 20, 1888 (Port Jackson).

? *Trygon pastinaca* (not Linnaeus) MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 313, 1880 (Port Darwin; Port Jackson).

*Dasyatis thetidus* (Ogilby) WAITE, Mem. Australian Mus., vol. 4, p. 46, 1899 (type locality: Newcastle Bight and off Wata Mooli, New South Wales).—McCULLOCH, Zool. Res. Endeavour, vol. 3, p. 104, 1915 (description in key); Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 462, pl. 40, fig. 1-2, text figs. 1 (tail), 3 (back of female), 1921 (off North Head, New South Wales, 20-40 fathoms); Fishes of New South Wales, ed. 2, p. 12, 1927.

*Dasyatis thetidis* STEAD, Fishes of Australia, p. 233, 1908 (New South Wales).

*Dasyatis sciera* JENKINS, Bull. U. S. Fish Comm., vol. 22 (1902), p. 421, pl. 1, fig. 2, 1904 (type locality: Honolulu).—SNYDER, Bull. U. S. Fish Comm., vol. 22 (1902), p. 515, 1904 (Honolulu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903), p. 47, pl. 4, fig. 2, 1905 (type).

Depth  $2\frac{1}{3}$  to end of tail; head  $7\frac{2}{3}$ ; disk length  $1\frac{1}{5}$  its width,  $1\frac{5}{6}$  in tail. Snout  $1\frac{1}{3}$  in head, ends in very slight point of broad angle; eye  $6\frac{3}{4}$ , 5 in snout,  $3\frac{1}{2}$  in interorbital; dentary width  $3\frac{1}{2}$  in head,  $1\frac{1}{3}$  in internasal; teeth in 40 to 44 rows in jaws (not 26 very oblique series as given by Jordan and Evermann); row of 8 fleshy points along floor of mouth; nostril large pit, simple, internarial broader than mouth; interorbital 2 in head, nearly level. Gill openings equidistant, last shortest. Spiracle large, deep, about  $1\frac{1}{2}$  eye diameters, edges entire.

Skin smooth. Caudal spine extracted. Tail rather rough or asperous terminally above.

Dorsal rudimentary, only as very slight, short median keel behind caudal spine; anal as long low median cutaneous keel below; pectorals form partly quadrangular disk, their outer hind edges slightly convex; broad ventrals rather short.

Uniform brown above. Tail dusky terminally. Under surface whitish, with pale brownish on outer marginal portions of pectorals.

Hawaiian Islands. Garman said of the tail "with top and sides armed with small tubercles and an irregular series of broad-based tubercles along each side. A pair of large erect compressed tubercles in front of the caudal spine, a single tubercle above the middle of

the pelvic arch, three larger, elongated tubercles the points of which extend backward above the middle of the shoulder girdle."

U.S.N.M. No. 64125. Honolulu. O. P. Jenkins. Length, 1,032 mm. Type of *Dasyatis sciera*.

**DASYATIS SEPHEN** (Forskål)

*Raja sephen* FORSKÅL, Descript. Animal., pp. VIII, 17, 1775 (type locality: Djedda, Lohaja, Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1508, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 533, 1792 (copied).—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 122, 1798 (Red Sea).—SCHNEIDER, Syst. Ichth., Bloch, p. 360, 1801 (Red Sea).—SHAW, General zoology, vol. 5, p. 288, 1804.

*Raia sephen* BONNATERRE, Tableau Encylop. Ichth., p. 4, 1788 (Red Sea).—CUVIER, Règne animal, vol. 2, p. 137, 1817 (reference).

*Trygonobatus sephen* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816 (name only).

*Trigon (Pastinachus) sephen* RÜPPELL, Atlas Reise Nördl. Afrika, Fische, p. 52, 1828.

*Trigon sephen* RÜPPELL, Neue Wirbelth. Fische, p. 69, 1835 (reference).

*Trygon sephen* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 482, 1870 (Indian Ocean, East Indies, Pinang, Seychelles).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Port Mackay).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 853, 1876 (New Britain).—DAY, Fishes of India, pt. 4, p. 740, pl. 195, fig. 2, 1878.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, p. 212, 1883 (Lower Burdekin River); vol. 9, p. 64, 1884 (Lower Burdekin River in salt water).—OEILBY, Cat. Fish. Australian Mus., pt. 1, p. 20, 1888 (Burdekin River; South East New Guinea).—DAY, Fauna British India, Fishes, vol. 1, p. 50, figs. 21–22, 1889.—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—BOULENGER, Proc. Zool. Soc. London, 1892, p. 136 (Muscat).—WEBER, Zool. Ergebni. Reise Niederländ. Ost.-Indien, p. 458, 1894 (Java, in fresh water).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 194, 1904 (Kuala Lumpur).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 240, 1907 (Palembang).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 35, 1909 (off Burma).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 384, 1910 (New Pomerania; Pelew Islands).—PEARSON, Ceylon Administr. Rep., 1912–13, p. E13.—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E41, E42, E45, E48, E50.—WEBER, *Siboga Exped.*, Fische, vol. 57, p. 604, 1913 (Aru Islands).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math-phys. Kl., vol. 26, p. 8, 1913 (Mekran and Oman).—BAMBER, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Sudanese Red Sea).—PEARSON, Ceylon Administr. Rep., 1915–18, p. F12.—OEILBY, Mem. Queensland Mus., vol. 5, p. 87, 1916 (Moreton Bay and Lower Burdekin River).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> Note, p. 77, 1929 (Cochinchina).

*Trygon (Hypolophus) sephen* KLUNZINGER, Verh. zool-bot. Ges. Wien, vol. 21, p. 680, 1871 (Red Sea).

*Hypolophus sephen* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 170, 1841 (India; Red Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, pt. 2, p. 429, 1849 (Sea of Pinang, Malay Peninsula, Singapore).—BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal).—GRAY, List Fish British Museum., p. 123, 1851 (India).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 77, 1852 (Batavia, Samarang, Gresik, Surabaja, Kammal, Surakarta); (Bengal), vol. 25, p. 9, 1853 [on Wolga

*tenkee* Russell, Fishes of Coromandel, vol. 1, p. 2, pl. 3 (Vizagapatam), p. 15 (on *Raia sancur* Buchanan-Hamilton), p. 82, 1803 (reference).—BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 37, 1860 (Calcutta).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 616, 1865 (Red Sea).—DAY, Fishes of Malabar, p. 279, 1865.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 461 (Baram, North Borneo).—OGILBY, Mem. Queensland Mus., vol. 5, p. 87, 1916 (Moreton Bay).—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 465, 1924 (Tale Sap, Outer Lake, Singora).

*Hypophthalmus sepheni* SÜVATTI, Index Fish. Siam, p. 5, 1937 (on Hora).

*Dasyatis sepheni* STEAD, Fishes of Australia, p. 233, 1908 (New South Wales).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 256, 1927 (Orion, Philippines); Journ. Bombay Nat. Hist. Soc., vol. 33, p. 102, 1928 (Bombay; Philippine example); Mem. Bishop Mus., vol. 10 p. 25, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (East Indies; Philippines); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (note).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 16, 1937 (reference).—FOWLER, List Fish. Malaya, p. 17, 1938 (reference).

*Dasyatis (Pastinachus) sephen* TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 12, 1935–36 (Mar Rosso; Massaua).

*Dasybatus sepheni* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 384, 1913 (Indian Ocean, Red Sea, East Indies, India).—SÜVATTI, Index Fish. Siam, p. 6, 1937 (Bangkok; Thale Sap, Inner Lake).

*Dasybatus (Pastinachus) sepheni* CHEVEY, Inst. Océanogr. Indochine, 19<sup>e</sup> Note, p. 7, 1932 (Cochinchina; Cambodia).

*Pastinachus sepheni* McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 12, pl. 3, fig. 37a, 1927.

*Raia sancur* BUCHANAN-HAMILTON, Fishes of Ganges, p. 2, 1822 (type locality: Ganges River).

*Trigon forskalii* RÜPPELL, Atlas Reise Nördl. Afrika, Fische, p. 53, pl. 13, fig. 2, 1828 (type locality: Red Sea).

*Trygon wogla-tenkee* CUVIER, Règne animal, ed. 2, vol. 2, p. 399, 1829 (on *Wogla-tenkee* Russell).

*Taeniura atra* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 598, 1883 (type locality: New Guinea).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 401, 1913 (copied).—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (copied); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

*Pastinachus sephen ater* WHITLEY, Rec. Australian Mus., vol. 18, No. 3, p. 99, 1931 (type of *Taeniura atra*; Burdekin River).

*Taeniura mortoni* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, pt. 2, p. 212, 1883 (type locality: Lower Burdekin River, Queensland); vol. 9, p. 64, 1884 (copied).—OGILBY, Mem. Queensland Mus., vol. 5, p. 87, 1916 (note).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 30, 1925 (reference).

*Taeniura lymma* (not Forskål) OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 20, 1888 (type of *Taeniura mortoni*; Cape York).

Depth  $11\frac{1}{4}$  to  $15\frac{1}{2}$  to end of tail; head  $6\frac{2}{3}$  to  $10\frac{1}{2}$ ; disk length  $1\frac{1}{8}$ ,  $1\frac{1}{4}$  in its width, 1 to  $1\frac{1}{2}$  in tail. Snout  $1\frac{1}{3}$  to  $1\frac{3}{4}$  in head, forms short point of wide blunt front profile angle; eye  $4\frac{2}{3}$  to  $5\frac{1}{2}$ , 3 to  $3\frac{7}{8}$  in snout,  $2\frac{3}{5}$  to 4 in interorbital; dentary width  $2\frac{4}{5}$  to 3 in head; teeth in 20 rows in jaws, upper dental plate bent forward

and lower plate more flattened, largest upper teeth each side of middle little broader than long; nostrils simple, deep pits, internarial about equals dentary width; interorbital  $1\frac{3}{5}$  to  $1\frac{2}{3}$ , nearly level. Gill openings moderate, equidistant, last smallest. Spiracle twice eye, deep, edges entire.

Skin of young smooth, with age finely and closely roughened all over middle of disk, 1 or 2 caudal spines present, second larger or nearly long as head.

No dorsal; anal as broad cutaneous fold 2 or 3 times deep as tail and extends more than half way to its slender tip; pectorals form partly quadrangular disk, angles obtuse and hind edges nearly straight; ventral short, wide, obtuse, hind edges convex; claspers short, narrow, slenderly pointed.

Back uniform brown. Below whitish. Anal fold blackish.

Red Sea, Arabia, Seychelles, India, Ceylon, Burma, Malay Peninsula, Pinang, East Indies, Philippines, Indo-China, Melanesia, Micronesia, Queensland, New South Wales. A well-marked species, readily known by its deep anal fold. According to Whitley the type of *Taeniura atra* measures 899 mm. and is still in the Australian Museum. The types of *Taeniura mortoni* are lost, though the Australian Museum has a specimen from Macleay's Burdekin River collection which agrees with his brief description, as follows:

Disk covered with minute spines and 3 or 4 round flattened tubercles in line of back on scapular region; sides of disk smooth or finely granular. Tail  $\frac{1}{2}$  longer than body, with broad rayless fin beneath extending to extremity; disk subcircular. Disk dark brown in center, sides pale color.

7448. Bolalo Bay. December 21, 1908. Length, 780 mm.

5531. Catbalogan. April 16, 1908. Length, 400 mm.

8291. Sorsogon market, Luzon. March 12, 1909. Length, 900 mm.

U.S.N.M. No. 39082. Burdekin River, Queensland. Australian Museum. Length, 1,070 mm.

#### DASYATIS GRUVELI Chabanaud

*Dasybatus (Pastinachus) gruveli* CHABANAUD, Bull. Mus. Hist. Nat. Paris, p. 45, fig. 1, 1923 (type locality: Gulf of Siam); Service Océanogr. Pêches Indo-Chine, 1<sup>e</sup> Note, p. 6, 1926 (Gulf of Siam).

*Dasyatis gruveli* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (reference).

Snout angle very obtuse, snout equals interorbital; eyes very protruded, somewhat larger than their apertures, longitudinally equals  $\frac{2}{3}$  mouth length; upper jaw forms sharp angle at symphysis drawn in reversed V with branches curved in obtuse angle and lower jaw strongly undulated; teeth yellowish, many smaller upon middle of upper jaw; oral papillae 4, median pair very close together; interorbital flat.

Skin soft above, with small asperities upon snout, interocular and crown, larger and very rough on back medially posteriorly and base of tail, upon middle of back form 3 or 4 longitudinal series of large convex scutes.

Tail nearly  $2\frac{1}{4}$  times disk, strongly depressed basally; single spine inserted little before first third in tail; lower fold extends from first fourth of tail nearly  $\frac{3}{4}$  total tail length; pectorals partly rhomboidal, front lateral edges partly convex, outer angles rounded, hind edges partly rectilinear; ventrals with outer angles rounded.

Gray-brown above, darker medially, below tail and especially terminally. Lower fold of tail brown passing to black at its free border. Below disk and tail whitish. Length, 1,000 mm. (Chabanaud.)

Gulf of Siam. Said to be related to *Dasyatis sephen* in body more convex, pectorals short before snout, and 4 oral papillae instead of 5.

#### DASYATIS AGULHENSISS Barnard

*Dasybatis agulhensis* BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 78, 1925 (type locality: Agulhas Bank, South Africa).

Snout obtusely angular, with small median point; eyes small, closer together than spiracles; teeth in about 46 rows, not angularly bent, each tooth more or less hollowed in center; cutaneous flaps on mouth floor 9, 3 median, 1 submedian, and 2 lateral; outer angles of internasal flap quadrate.

Disk smooth, except 3 or 4 small tubercles on radiate bases on point of snout, 1 or 2 slightly larger ones before each orbit and 4 compressed spinelike scutes in middle of back between posterior gills. Tail tuberculate.

Tail  $1\frac{1}{3}$  times body length, not basally depressed, with lower cutaneous fold extending from beneath spine to or almost to tip, about  $\frac{1}{3}$  tail depth; single caudal spine length  $\frac{1}{2}$  its distance from tail base; pectorals form disk little wider than long, front margin of pectoral slightly longer than hind margin also straight or slightly concave, lateral and posterior angles rounded.

Uniform bluish slate. Length, 1,905 mm. (Barnard.)  
South Africa.

#### DASYATIS SCHREINERI (Gilchrist)

*Trygon schreineri* GILCHRIST, Trans. Roy. Soc. South Africa, vol. 3, p. 33 (text fig.), 1913 (type locality: "Off the rocks at St. James in False Bay").

*Dasybatis schreineri* VON BONDE and SWART, Marine Biol. Surv. South Africa Rep., pt. 3, 1922, p. 16, 1924 (reference).

*Dasyatis schreineri* BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 76, 1925 (False Bay, Agulhas Bank to 40 fathoms).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 409, 1934 (Natal).

Eyes small; teeth with transverse ridges, in about 33 to 48 rows; 5 oral papillae on mouth floor; outer angles of internasal flap rounded; interorbital less than interspiracle width.

Disk smooth. Tail tuberculate. Series of 7 median spines, increasing in length to sixth, which about  $\frac{1}{3}$  length of tail, seventh considerably less.

Tail subequal to body length, with cutaneous fold below ending before tip of tail, deepest anteriorly where  $\frac{3}{4}$  diameter of tail above; large caudal spine preceded by small one; pectorals form disk little wider than long, front edges also longer than hind edges; front profile of disk as seen above broadly convex, with very small median point, lateral and posterior angles rounded.

Dark greenish slate above, whitish below. Reaches 1,830 mm. (Barnard.)

South Africa. The type destroyed.

**DASYATIS BREVICAUDATUS (Hutton)**

*Trygon brevicaudatus* HUTTON, Ann. Mag. Nat. Hist., ser. 4, vol. 16, p. 317, 1875  
(type locality: Dunedin Harbor, New Zealand); Trans. Proc. New Zealand Inst., vol. 8, p. 216, 1876.

*Dasybatis brevicaudatus* HUTTON, Index Fauna New Zealand, p. 53, 1904.

*Dasybatis brevicaudatus* WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 151, pl. 22, 1909 (off Table Cape and Bay of Plenty, 34–55 fathoms).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 385, 1913 (New Zealand).

*Dasyatis brevicaudatus* McCULLOCH, Biol. Res. Endeavour, vol. 3, pt. 3, p. 102, pl. 15, fig. 1, pl. 17, fig. 1, 1915 (Bass Strait, in 60 fathoms).—McCULLOCH and WAITE, Trans. Proc. Roy. Soc. South Australia, vol. 39, p. 461, 1915 (Great Australian Bight, in 22 fathoms).—WAITE, Rec. South Australian Mus., vol. 2, p. 31, fig. 44, 1921.—McCULLOCH, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 462, text fig. 2 (tail), 1921 (New South Wales and South Australia, in 20–40 fathoms); Fishes of New South Wales, ed. 2, p. 12, pl. 3, fig. 36c, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (reference).

*Bathytochia brevicaudata* WHITLEY, Rec. Austral. Mus., vol. 19, No. 1, p. 61, 1933 (reference).

*Trygon thalassia* (not Müller and Henle) HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 85, 1872 (dried tail); Trans. New Zealand Inst., vol. 8, p. 216, 1876.

*Trigon thalassia* HECTOR, Handb. New Zealand, p. 16, 1879.

Head to hind spiracle edge  $5\frac{1}{10}$  in total length. Snout  $1\frac{1}{2}$  in head to hind spiracle edge; eye 8, 6 in snout, 4 in interorbital; mouth width slightly less than  $1\frac{1}{2}$  in preoral length; lateral teeth tubercular, inner each with angular cusp with longest on median line; broad fimbriated flap behind upper jaw and 5 papillae inside lower, of which outer pair smaller than and remote from other 3; internarial little less than their distance from snout tip, outer angles of lobe acute, hind edge with narrow papillose flap forming 2 small lobes near median line; interorbital  $2\frac{1}{4}$  in head to hind spiracle edge. Spiracles very large, longer than broad,  $1\frac{1}{8}$  in interorbital.

Disk smooth above and below. Tail smooth basally, few small scat-

tered spines on sides level with spine insertion more numerous and finally rough terminally.

Tail very slightly shorter than rest of body, depressed before and cylindrical behind spine, which inserted little before first third of tail, length equals head to hind spiracle edge; tail with low cutaneous fold on under surface below caudal spine; pectorals form subquadrangular disk, length  $1\frac{1}{6}$  in its width, angle of snout broadly obtuse, front edges indistinctly sinuous, outer angles rounded, posterolateral borders little convex, nearly straight and form obtuse angle with inner margins; ventrals with convex margins, angles somewhat rounded.

Uniform pale grayish brown above, white below. Width, 1,080 mm. (McCulloch.)

South Australia, New South Wales, Bass Strait, New Zealand.

#### Subgenus *DASYATIS* Rafinesque

##### *DASYATIS PASTINACUS* (Linnaeus)

*Raja pastinaca* LINNAEUS, Syst. Nat., ed. 10., vol. 1, p. 232, 1758 (type locality: Europe).—FORSKÅL, Descript. Animal., p. XVIII, 1775 (Malta).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1509, 1789 (Europe, Red Sea, Indian Sea.).—WALBAUM, Artedi Pisc., vol. 3, p. 527, 1792 (on Linnaeus).—FORSTER, Fauna Indica, p. 13, 1795.—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 114, 1798 (compiled).

*Trygon pastinaca* BONAPARTE, Icon. Fauna Italica, Pesci, vol. 3, pt. 2, fasc. 6, descr., pl., 1834 (Italy); Cat. Metod. Pesci Europei, p. 12, 1846 (Mediterranean; Atlantic).—NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 320, 1922 (Natal).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).

*Trigon pastinaca* GUIGHENOT, Notes île Réunion, vol. 2, p. 32, 1863.—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 4, 1891.

*Dasyatis pastinaca* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 474 (Italy; Beirut, Syria); 1923, p. 35 (Beirut example).

*Dasybatus pastinacoides* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 389, 1913 (Eastern Atlantic; Mediterranean).

*Dasybatus pastinacoides* BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 77, pl. 4, fig. 8, 1925 (Agulhas Bank to Natal Coast).

*Trygon vulgaris* RISSO, Hist. Nat. Europe merid., Poissons, vol. 3, p. 160, 1826 (type locality: Nice).

*Pastinaca laevis* GRAY, Cat. Fish Gronow, p. 11, 1854 (type locality: Atlantic coasts of Europe).

*Trygon pastinaca* var. *marmorata* STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-Nat. Kl., vol. 59, p. 381, pl. 3, fig. 1, 1892 (type locality: Bay of Goreé, Senegambia).

Depth  $5\frac{1}{2}$  to 7 in length of disk (measured to hind pectoral edge); head to first gill opening  $2\frac{4}{5}$ . Snout  $1\frac{2}{5}$  to  $1\frac{2}{3}$  in head; eye 5 to 7, 4 to  $5\frac{1}{2}$  in snout, 3 to  $3\frac{1}{2}$  in interorbital; mouth width  $2\frac{7}{8}$  to  $3\frac{1}{8}$  in head to first gill opening; teeth in 23 to 33 rows above, 22 to 32 below, small, with obtuse points or cusps; preoral length  $1\frac{1}{2}$  to  $1\frac{3}{4}$  in head; internarial  $2\frac{4}{5}$  to  $3\frac{1}{2}$ ; interorbital  $1\frac{1}{2}$  to  $1\frac{7}{8}$ , depressed, with

eyes little elevated each side. Spiracles  $1\frac{1}{4}$  to  $1\frac{1}{2}$  times larger than eyes. Third gill opening largest, subequal with eye.

Skin smooth.

Tail slightly longer than disk, with short low fold behind tip of spine and longer lower one below, spine about equals interorbital; pectorals form broad subquadrangular disk, length  $1\frac{1}{5}$  to  $1\frac{1}{4}$  its width, front edge nearly straight or but slightly convex, hind edge slightly convex; ventral broad, obtuse.

Above ecru drab to fawn color, outer margins of disk pale, tail also deeply colored like middle of back. Under surface of disk creamy white, with outer margins of pectorals broadly pale brown.

South Africa, Natal, Madagascar, India. Also in the Atlantic.

380 to 384 A.N.S.P. Italy. C. L. Bonaparte. No. 219. Dr. T. B. Wilson. Length, 315-410 mm.

#### Subgenus AMPHOTISTIUS Garman

##### DASYATIS SINENSIS (Steindachner)

*Trygon sinensis* STEINDACHNER, Anz. Akad. Wiss. Wien, vol. 29, p. 133, 1892  
(type locality: Shanghai); Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 59, p. 382, pl. 6, 1892 (type).

*Dasybatus sinensis* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 393, 1913  
(Shanghai).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 166,  
figs. 12-12a, pl. 5, fig. 7 (teeth), pl. 4, fig. 1 (scale), 1932 (Antung).

*Dasyatis sinensis* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505,  
1930 (reference); Hong Kong Nat., vol. 1, p. 179, 1930 (compiled).

Head to hind spiracle edge  $6\frac{2}{5}$  in total length. Snout  $1\frac{1}{3}$  in head to hind spiracle edge, as seen from above upper edge forms point slightly less than right angle; eye 11,  $8\frac{1}{4}$  in snout, 5 in interorbital; mouth waved; about 30 rows of upper teeth, pointed in male; 5 oral papillae, 3 close together, forward, others wider spaced near mouth angles; internarial slightly greater than mouth width, hind edge very slightly waved; interorbital  $2\frac{2}{5}$  in head to hind spiracle edges. Spiracle close behind eye, equals  $2\frac{1}{4}$  eye diameters, interspace  $2\frac{1}{4}$  in head to hind spiracle edge.

Finely roughened above snout, over interorbital, branchial region and back toward caudal spine, with asperities slightly larger on vertebral line.

Tail tapers, filamentous, spine removed though inserted near first fifth of tail, with dermal fold above and little higher and longer one below; pectorals form rhomboidal disk, front edge largely convex, angles widely convex and hind edges nearly straight; ventrals with wide hind edges, obtuse; claspers robust, long as interorbital.

Above and medially light gray, with broad lateral yellowish brown edges. Disk length, 320 mm.; tail, 510 mm. (Steindachner.)

China.

**DASYATIS FLUVIORUM Ogilby**

*Dasyatis fluviorum* OGILBY, Proc. Roy. Soc. Queensland, vol. 21, p. 6, 1908 (type locality: Brisbane River, above tides).—MCCULLOCH, Biol. Res. *Endeavour*, vol. 3, pt. 3, p. 103, pl. 16, fig. 1, pl. 17, fig. 2, 1915 (Brisbane River and Port Jackson).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 12, pl. 3, fig. 36b, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (compiled).

*Dasybatis fluviorum* TOSH, Marine Biol. Rep. Queensland, pl. 4, fig. 3, 1903.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 394, 1913 (compiled).—OGILBY, Commerc. Fish Fisher. Queensland, p. 45, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 130, 1916 (Nerang Creek; Great Sandy Strait; Moreton Bay).

*Toshia fluviorum* WHITLEY, Rec. Austral. Mus., vol. 19, No. 1, p. 60, 1933 (reference).

*Trygon pastinaca* (not Linnaeus) MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 366, 1878 (Port Darwin).—GÜNTHER, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 37, 1880 (Arafura Sea).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 377, 1881 (Port Darwin; Port Jackson).—OGILBY Cat. Fishes Australian Mus., pt. 1, p. 19, 1888 (Port Jackson).—KENT, Great Barrier Reef, p. 267, 1893 (Queensland).

Head to hind spiracle edge  $8\frac{1}{2}$  in total length. Snout  $1\frac{3}{5}$  in head to hind spiracle edge, seen above snout forms obtuse angle slightly projecting beyond front contour; eye 6, 4 in snout,  $3\frac{2}{3}$  in interorbital; mouth width equals internarial between front nasal angles, jaws undulated; lower lip corrugated; upper jaw succeeded by wide, fimbriated, membranous flap, bearing 30 cilia on free border; mouth floor with 7 papillae in 3 groups; free edge of nasal flap minutely fringed; interorbital  $1\frac{4}{5}$  in head to hind spiracle edge. Spiracles close behind eyes, little larger, interspace about equals interorbital.

Row of small, open, mucigerous papillae between snout tip and frontal depression; each preorbital group with much larger group, extending backward above and below eye and united to rostral system by oblique series of single pores; small, irregular cluster outside and partly anterior to preorbital group; semicircular series either side of and pair transversely within occipital depression; crescentic biserial band of subcutaneous tubular pores below and well outside eye; similarly situated oval cluster below spiracles. Small group of blunt tubercles above each spiracle, from which more or less extended series curves forward along supraciliary edge; transverse row of 3 tubercles behind occipital depression, from behind middle one series of retrorse spines extends along dorsal ridge and continues on tail nearly to caudal spine base; 1 of median interscapular spines slightly larger than others of vertebral series; entire scapular region tuberculigerous, central group quinqueradiate, one branch directed forward along and converging on axial series, 2 directed outward to level with spiracle and 2 backward but somewhat divergent from

axis; on either side between basal angles of outer and hinder branches 2 or 3 enlarged tubercles. Spinous tubercles of tail, especially 4 nearest caudal spine, larger than those of dorsal ridge; sides of tail with few scattered prickles.

Tail elongated, slender, with upper short fold, highest posteriorly and overlapped in front by caudal spine, lower surface of tail with much larger and slightly higher fold which originates below base of caudal spine; caudal spine inserted about first sixth in tail length, long as snout; pectorals form subcircular disk, length very slightly less than width or about half tail length, front edges linear, outer angles widely obtuse, hind borders rather feebly and inner moderately convex; outer ventral border nearly straight, long as snout.

Olive brown above, edges of disk and ventral fins lighter. Tail black, lower surface and sides of basal fourth brown. Spine and tubercles whitish. Lower surfaces bluish white, discal borders brown. Length, about 794 mm. (Ogilby, McCulloch.)

New South Wales, Queensland.

#### DASYATIS USHIEI Jordan and Hubbs

*Dasyatis ushiei* JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 114, 1925  
 (type locality: Mikawa Bay, Japan).—FOWLER, Proc. 4th (1929) Pacific  
 Sci. Congr., Java, p. 506, 1930 (compiled).

Snout tip but slightly produced, front angle  $150^{\circ}$ ; eyes somewhat elevated; mouth width about  $\frac{1}{4}$  less than internarial, little less than half preoral, which  $\frac{1}{3}$  space from mouth to inner hind angle of ventrals; only 23 oblique rows of upper teeth; 7 oral papillae, in 3 groups of which median comprises 3 papillae; interorbital flattish,  $\frac{2}{3}$  long as snout. Orbit large as spiracle which rhomboid and faces about equally outward, upward, and forward.

Body smooth and smooth shagreen only on posterior  $\frac{3}{4}$  of tail.

Tail little more than twice disk length, slightly compressed anteriorly, terete and whiplike behind spine base; its upper edge with rudimentary keel shorter than orbit located not far behind spine base and lower edge with very low fold with origin opposite spine base extending nearly  $\frac{1}{3}$  of space to tail tip, where grading into low keel, covered with shagreen, which extends almost to extreme tail tip; pectorals form disk nearly  $\frac{1}{4}$  broader than long, front margin nearly straight.

Above gray, with some blackish margins of irregular form and disposition. Tail mostly blackish, white mottled with darker on lower surface of thickened basal portion. Disk white below, with darker clouds towards margin posteriorly. Length, 988 mm. (Jordan and Hubbs.)

Japan.

## DASYATIS NAVARRAE (Steindachner)

*Trygon navaruae* STEINDACHNER, Anz. Akad. Wiss. Wien, vol. 29, p. 132, 1892  
 (type locality: Shanghai); Denkschr. Akad. Wiss. Wien, Math.-nat. Kl.,  
 vol. 59, p. 381, pl. 5, 1892 (type).

*Dasybatus navaruae* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 393, 1913  
 (Shanghai).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, No. 5, p.  
 167, figs. 13-13a, pl. 5, fig. 8 (teeth), 1932 (Tsigtao).

*Dasyatis navaruae* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505,  
 1930 (reference); Hong Kong Nat., vol. 1, p. 180, 1930 (compiled).

*Dasyatis bennetti* (not Müller and Henle) JORDAN and RICHARDSON, Mem. Carne-  
 gie Mus., vol. 4, p. 164, pl. 65, 1909 (Takao).

Head to hind spiracle edge  $9\frac{1}{2}$  in total length. Snout  $1\frac{1}{3}$  in head to hind spiracle edge; eye  $6\frac{1}{2}$ , 5 in snout,  $3\frac{1}{2}$  in interorbital; mouth width  $2\frac{1}{2}$  in interspace between first pair of gill openings; margin of nasal flap with short fringe; interorbital 2 in head to hind spiracle edge. Spiracles little larger and close behind eye, interspace  $1\frac{1}{3}$  in head.

Median vertebral row of short strong spines begin behind branchial region and extend to caudal spine; tail largely and over terminal portion above roughened by minute spine-like tubercles.

Tail long, whiplike, with serrated spine 2 in head to hind spiracle edge; behind reflexed spine very short low fold on top of tail extends back for space equal to interorbital; below and beginning under spine low black cutaneous fold extends back 3 times interorbital; pectorals form rhomboid disk, long as wide or  $2\frac{1}{4}$  in tail, front edges nearly straight, outer angles rather evenly convex and hind edges slightly convex; ventrals obtuse, width  $1\frac{1}{4}$  in interorbital.

Uniform blackish above, pale below. Tail without bands. Length, 1,145 mm. (Jordan and Richardson.)

China, Formosa. The type, a mature male with the disk 330 mm. long, had a band of minute denticles longitudinally over each eye, along the vertebral column and grouped about the center of the disk.

## DASYATIS KUHLII (Müller and Henle)

*Trygon kuhlii* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 164, pl. 50,  
 1841 (type locality: Vanicoro, New Guinea, India).—SCHLEGEL, in Siebold's  
 Fauna Japonica, Poiss., pt. 15, p. 308, 1850 (Japan).—GRAY, List fish  
 British Museum, p. 120, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 73, 1852 (Batavia; Samarang); (Japan),  
 vol. 25, p. 22, 1853 (Japan, East Indies, New Guinea, Vanicolo, West India);  
 (Bengal), vol. 25, p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië,  
 vol. 7, p. 228, 1854 (Macassar); vol. 10, p. 348, 1856 (Rio, Bintang); Act.  
 Soc. Sci. Ind. Néerl., vol. 1, No. 3, pp. 8, 10, 1856 (Macassar); vol. 2, No. 7,  
 p. 9, 1857 (Amboina); Nat. Tijdschr. Nederland Indië, vol. 20, p. 141, 1859-60  
 (Badjoa, Boni).—KNER, Reise Norara, Fische, p. 420, 1865 ("Auckland").—  
 GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 479, 1870 (Zanzibar; East  
 Indies).—HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 85, 1872 (Kner's Auckland record).—PETERS, Monatsb. Akad. Wiss.

Berlin, 1876, p. 853 (New Ireland).—DAY, Fishes of India, pt. 4, p. 739, pl. 193, fig. 2, 1878 (Madras).—MEYER, Anal. Soc. Espan. Hist. Nat., Madrid, vol. 14, p. 49, 1885 (North Celebes).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 19, 1888 (Parramatta River, New South Wales; Malay Archipelago; Tonga; Port Essington; Ugi, Solomons; South East New Guinea).—DAY, Fauna British India, Fishes, vol. 1, p. 52, 1889.—ANNANDALE, Mem. Indian Mus., vol. 2, p. 34, 1909 (off Gopalpur, 24 fathoms).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 494, 1910 (New Caledonia, New Mecklenburg, Tongatabu, Samoa).—PEARSON, Ceylon Administr. Rep., 1912–13, p. E12.—WEBER, *Siboga* Exped., vol. 57, Fische, p. 603, 1913 (Makassar, Sulu, Menado, Saleyer).—PEARSON, Ceylon Administr. Rep., 1914, pp. F4, F10, F15, F16, F18.—RAJ, Rec. Indian Mus., vol. 10, p. 317, 1914 (habits).—MALPAS, Ceylon Administr. Rep., 1921, pp. E5–E8; 1922, p. F6.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> Note, p. 77, 1929 (Cochin China).

*Trygon kuhli* BLEEKER, Nat. Tijds. Nederland. Indië, vol. 20, pp. 238, 447, 1859–60 (Singapore).—GÜNTHER, Rep. Voy. *Challenger*, vol. 1, p. 58, 1880 (Tongatabu).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 741, 1900 (Yokohama).—SOUTHWELL, Ceylon Administr. Rep. 1912–13, pp. E41–E48, E50.

*Trygon (Trygon) kuhlii* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 603, 1865 (Sea of the Indies, Amboina, Java, Vanieolo, New Guinea).

*Trigon kuhlii* SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.

*Trygon kuhelii* PEARSON, Ceylon Administr. Rep., 1915–18, p. F17.

*Leiobatus kuhlii* BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).

*Dasybatis kuhlii* GARMAN, Proc. U. S. Nat. Mus., vol. 8, p. 40, 1885 (no locality); Mem. Mus. Comp. Zool., vol. 36, p. 395, 1913 (Japan, India, East Indies).—OGILBY, Commerce Fish Fisher. Queensland, p. 45, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 87, 1916 (Coolangatta, Currumbin, Merang Creek, Moreton Bay, Port Curtis, Nor West Islet, Edgecombe Bay).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 12, 1934 (Dumaguete: Capiz; Sitanki).

*Dasybatis (Amphotistius) kuhlii* CHEVEY, Inst. Océanogr. Indochine, 19<sup>e</sup> note, p. 7, 1932 (Cochinchina; Cambodia).

*Dasybatis kuhlii* SUVATTI, Index Fish. Siam, p. 6, 1937 (Siracha).

*Dasyatis kuhlii* JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 42, 1901 (Nagasaki; Yokohama).—TOSH, Marine Biol. Rep. Queensland, pl. 5, fig. 1, 1903.—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 659, 1903 (Hakodate, Tokyo, Misaki, Wakanoura, Onomichi, Hiroshima).—WAITE, Mem. New South Wales Nat. Club, No. 2, p. 11, 1904.—McCULLOCH, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 46, pl. 39, figs. 1–2, 1921 (off Bustard Head, Queensland, 14–20 fathoms; Parramatta River estuary).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 62, p. 1, 1922 (Cebu).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 11, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (Ugi, Solomons).—WHITLEY, Journ. Pan Pacific Inst., vol. 3, p. 11, 1928 (Santa Cruz Islands).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Solomons, Japan, Indian Ocean); Mem. Bishop Mus., vol. 11, p. 314, 1931 (reference).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 270, fig. 24, 1932 (Chefoo).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 111, 1933 (Chusan).—FOWLER, Proc. Acad. Nat.

*Sci. Philadelphia*, vol. 87, p. 90, 1935 (Bangkok).—**Roxas** and **Martin**, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 16, 1937 (reference).—**Fowler**, List Fish. Malaya, p. 16, 1938 (reference).

*Dasyatis kuhli* JORDAN and SEALE, Bull. Bur. Fisher., vol. 26, 1906 p. 4, 1907 (Philippines).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).—SEALE, Philippine Journ. Sci., vol. 5, p. 264, 1910 (Philippines).

*Trygon glauconotus* (Kuhl and Van Hasselt) BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 74, 1852 (type locality: Java). (Name in synonymy.)

*Raya trigonoides* CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 121, 1873 (type locality: New Caledonia).

*Dasybatus varidens* GARMAN, Proc. U. S. Nat. Mus., vol. 8, p. 40, 1885 (type locality: Hongkong).

*Dasyatis varidens* FOWLER, Hong Kong Nat., vol. 1, p. 181, 1930 (compiled).

Depth  $13\frac{7}{8}$  to  $14\frac{1}{5}$  to end of tail; head  $6\frac{1}{2}$  to 8; disk length  $1\frac{1}{5}$  to  $1\frac{1}{4}$  its width,  $1\frac{1}{3}$  to  $1\frac{1}{2}$  in tail. Snout  $1\frac{2}{5}$  to  $1\frac{1}{2}$  in head, meets at very blunt angle in front; eye  $4\frac{2}{3}$  to 5 in head, 3 to  $3\frac{1}{2}$  in snout, 3 to  $3\frac{2}{3}$  in interorbital; dentary width  $3\frac{1}{4}$  to  $4\frac{1}{4}$  in head; teeth in 25 to 30 rows in jaws, rhombic, cusps as slight keel; nostrils deep, simple, internarial equals dentary width; interorbital  $1\frac{2}{5}$  to  $1\frac{4}{5}$  in head, nearly level. Gill openings small, equidistant, last smallest. Spiracle greatly larger than eye, deep, edges entire.

Skin smooth. Caudal spine extracted.

Dorsal as short, low, median, cutaneous fold behind spine; anal as long and much deeper one below, deep as tail depth; pectoral with outer posterior edges almost straight, angles blunt; ventrals triangular, front edge straight and hind edge little convex.

Brown above, with darker mottling or specks about eyes and interorbital. Variable gray spots, not larger than eye and often with slightly darker marginal rings, scattered about disk, though largest ones posterior at each side of disk. Tail like back, though with 3 distinct buff rings terminally, but crossing dark cutaneous anal. Under surface of disk whitish.

Zanzibar, India, Ceylon, Singapore, East Indies, Philippines, Cochinchina, China, Japan, West Australia, Queensland, New South Wales, Melanesia, Micronesia, Polynesia. Recorded by Kner from Auckland, New Zealand, locality doubtless erroneous. Müller and Henle show a figure with 2 caudal spines, also a very few small rounded blue spots on each pectoral medianly, besides an imperfect row of vertebral spines on back. Garman says: "Skin smooth on the young, later a vertebral series of depressed tubercles appears from the shoulder girdle forward, to be still later continued backward to the caudal spine."

9327. Cebu market. August 17, 1909. Length, 393 mm.

9328. Cebu market. August 17, 1909. Length, 585 mm.

6283. Manila. June 11, 1908. Length, 325 mm.

5110. Sandakan Bay, Borneo. March 3, 1908. Length, 630 mm.

U.S.N.M. No. 6529. Hong Kong. William Stimpson. Length, 350 mm. Type of *Dasybatus varidens*. A young male with rather slender, pointed claspers about equal to internarial space. The contour shows greatest disk width opposite disk center and posterior inclined edges of pectorals slightly convex. Traces of blue blotches or spots on disk medially and tail with at least 3 pale or buff transverse rings terminally. Caudal spine removed.

U.S.N.M. No. 84207. Philippine Islands. Length, 313 mm. (not 613 as given by Fowler and Bean).

U.S.N.M. No. 31516. New Guinea. Australian Museum. Length, 530 mm.

U.S.N.M. No. 26519. No locality. No donor. Length, 390 mm. Only 3 small pale ocelli on right pectoral posteriorly and basally and 2 on left pectoral.

U.S.N.M. No. 39988. Ugi, Solomons. Australian Museum. Length, 535 mm. Well marked, with variable gray ocelli posteriorly on disk above.

U.S.N.M. No. 5800. Zamboanga. Dr. E. A. Mearns. Length, 345 mm., tail cut off near base.

#### DASYATIS BREVIS (Garman)

*Trygon brevis* GARMAN, Bull. Mus. Comp. Zool., vol. 6, p. 171, 1880 (type locality: Payta, South America).

*Dasibatis brevis* (Garman) JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 70, 1883 (Peru).

*Dasybatus brevis* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 396, pl. 32, figs. 5-6, 1913 (Peru and California).

*Dasyatis brevis* FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (Honolulu; type of *Dasyatis hawaiiensis*) ; Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Hawaii; California) ; Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (Honolulu).

*Dasyatis hawaiiensis* JENKINS, Bull. U. S. Fish. Comm., vol. 22 (1902), p. 420, pl. 1, fig. 1, 1904 (type locality: Honolulu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903) p. 48, pl. 4, fig. 1, 1905 (type).

*Trygon hawaiiensis* GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 494, 1910 (copied).

Depth 15½ to end of tail; head 7½; disk length 1⅓ in its width. 1½ in tail. Snout 1½ in head, meets at wide or blunt angle in front; eye 6, 4½ in snout, 4 in interorbital; dentary width 3 in head; teeth in 30 rows in jaws rhombic, smooth, cusps barely evident; nostrils deep, simple, internarial slightly greater than dentary width; interorbital 1½ in head, nearly level. Gill openings small, equidistant, last smallest. Spiracles greatly larger than eye, deep, edges entire.

Skin smooth. Caudal spine about 1⅛ in interspiracle width.

Dorsal as short low median cutaneous fold behind spine; anal as longer and deeper fold; pectorals with outer edges convex, both in front and posteriorly; ventrals rather obtuse, hind edge convex; claspers short and pointed.

Uniform brown above, disk paler marginally. Lower surface of disk whitish. Tail dusky to blackish terminally, also cutaneous dorsal and anal folds.

Hawaiian Islands. Also Peru and California. Garman says "Disk naked in young. Adults have three rows of tubercles on the back."

U.S.N.M. No. 64127. Honolulu. O. P. Jenkins. Length, 420 mm. Type of *Dasyatis hawaiiensis*.

DASYATIS AKAJEI (Müller and Henle)

*Trygon akajei* (Bürger) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 165, pl. 53, 1841 (type locality: Southwest coast of Japan).—RICHARDSON, Ichth. China Japan, p. 197, 1846 (copied).—SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 308, 1850 (Japan).—GRAY, List fish British Museum, p. 120, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Japan); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 10, p. 44, 1858 (Nagasaki).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 104, 1881 (Swatow).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 24, 1930 (Far East Seas).

*Trygon (Trygon) akajei* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 604, 1865 (compiled).

*Trygon pastinaca* var. *akajei* MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Yokohama, Tschifu, Schott-müller).

*Pastinaca akajei* (Bürger) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 165, 1841 (name in synonymy).

*Dasyatis akajei* RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 56 (Swatow).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 42, 1901 (Nagasaki).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 319, fig. 2, 1902 (Formosa).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 659, 1903 (Onomichi, Tokyo, Matsushima, Misaki, Wakanoura, Hiroshima, Tsuruga, Hakata, Kawatana, Nagasaki).—PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 639, 1908 (Japan).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 164, fig. 2, 1909 (copied).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 473 (Onomichi example).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Otaru, Shioyama, Tokyo, Misaki).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 6, p. 6, fig. 4, 1913 (Fusan).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Jusangata).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 114, 1925 (Miyuzu, Mikawa Bay).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Japan).—SCHMIDT and LINDBERG, Bull. Acad. Sci. U. S. S. R., p. 1137, 1930 (Tsuruga).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 272, fig. 25, 1932 (Chefoo).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 111, 1933 (Chusan; Ningpo; Yenting; Chinhai; Haimen; Wenchow).

*Dasybatis akajei* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 394, 1913 (Japan; China).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 12, 1931 (Fusan).—TANAKA, Jap. Fish. Life Colours, No. 32, 1933.

? *Trygon pastinaca* (not Linnaeus) GÜNTHER, Rep. Voy. Challenger, vol. 1, p. 63, 1880 (Yokohama).

Depth 12 to  $17\frac{3}{5}$  to end of tail; head  $6\frac{1}{4}$  to 8; disk length  $1\frac{1}{10}$  to  $1\frac{1}{5}$  in its width,  $1\frac{1}{5}$  to 2 in tail. Snout  $1\frac{2}{5}$  to  $1\frac{3}{5}$  in head, forms an obtuse angle with very slight point at tip; eye  $5\frac{1}{4}$  to 7 in head,  $3\frac{1}{2}$  to  $5\frac{1}{2}$  in snout,  $3\frac{1}{2}$  to  $4\frac{1}{2}$  in interorbital; dentary width 3 to 4 in head; teeth in 20 to 25 rows in jaws, rhombic, each with feeble cusp; nostrils deep, simple, internarial equals dentary width; interorbital  $1\frac{2}{5}$  to  $1\frac{3}{4}$  in head, nearly level. Gill openings equidistant,

subequal or last little shorter. Spiracle large, deep, little larger than eye, close below and along its hind edge.

Skin smooth. Spine nearly or quite equals width between spiracles.

Dorsal as median cutaneous keel behind spine on tail; anal similarly on tail below, only little higher; pectorals form rhomboid disk, outer and posterior angles rounded; ventrals obliquely truncate, angles obtuse.

Uniform brown above, little paler about edges of disk. Whitish below, outer margins of disk little brownish. Tail terminally and membranes representing dorsal and anal dusky to blackish brown.

China, Japan, Korea. Though my specimens are all small Garman says "larger examples with tubercles on the middle of the back above the shoulder girdle, and more advanced stages with a vertebral row of backward-directed tubercles from the back of the head, largest on the base of the tail in front of the caudal spine and with a parallel row on each shoulder." Müller and Henle's figure shows two caudal spines and row of seven vertebral spines at front of back.

U.S.N.M. No. 26544. Japan. Prof. E. S. Morse. Length, 168 mm.

U.S.N.M. No. 50734. Wakanoura, Japan. Jordan and Snyder. Length, 305 mm.

U.S.N.M. No. 57511. Japan. P. L. Jouy. Length, 400 mm. As *Dasyatis kuhlii*.

U.S.N.M. No. 71128. Japan. Albatross collection. Length, 298 mm.

U.S.N.M. No. 71906. Tokyo market. Albatross collection. Length, 326 mm.

U.S.N.M. No. 71903. Misaki, Japan. Albatross collection 1906. Length, 610 mm.

One caudal spine. Uniform dark slaty above.

U.S.N.M. No. 71905. Shiogama, Japan. Albatross collection 1906. Length, 584 mm. Two caudal spines, upper little longer.

U.S.N.M. No. 22613. Awa, Japan. Japanese Government. Length, 518 mm.

U.S.N.M. No. 51287. Wakanoura, Japan. Jordan and Snyder. Length, 770 mm.

Tubercle on tail opposite hind ventral ends and preceded by 3 small vertebral tubercles. Small tubercle in center of disk, preceded by row of 18 small ones.

U.S.N.M. No. 75869. Japan ? P. L. Jouy. Two examples, 525 and 550 mm.

1 example. A.N.S.P. Onomichi, Japan. Jordan and Snyder. Length ?

#### DASYATIS ZUGEI (Müller and Henle)

*Trygon zugei* (Bürger) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 165, pl. 53, 1841 (type locality: Japan, China, Pondicherry, India).—RICHARDSON, Ichth. China Japan, p. 197, 1846 (China, Macao).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1408, 1849 (Pinang, Malay Peninsula, Singapore).—SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 309, 1850 (Nagasaki Bay).—GRAY, List fish British Museum, p. 120, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 68, 1852 (Batavia); Nat. Tijdschr. Nederland. Indië, vol. 3, p. 446, 1852 (Banka); Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Bengal); vol. 25, p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 10, p. 348, 1856 (Rio, Bintang); vol. 11, p. 419, 1856 (Muntok, Java); Verh. Batav. Genootsch. (Japan), vol. 26, p. 6, 1857 (Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 7, 1857 (Japan); Nat. Tijds. Nederland. Indië, vol.

16, p. 409, 1858 (Japara, Java).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 481, 1870 (Japan, East Indies, Pinang, Madras).—DAY, Fishes of India, pt. 4, p. 739, pl. 190, fig. 3, 1878 (Madras).—Ogilby, Cat. Fishes Australian Mus., pt. 1, p. 20, 1888 (Madras).—DAY, Fauna British India, Fishes, vol. 1, p. 52, 1889.—ANNANDALE, Mem. Indian Mus., vol. 2, p. 33, pl. 4, fig. 2, 1909 (off Burma and Orissa).—PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 4, 1912 (Hong Kong).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 603, 1913 (Java).—PEARSON, Ceylon Administr. Rep., 1915–18, pp. F12–F14.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, p. 77, 1929 (Cochin China).

*Trygon (Trygon) zugei* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 606, 1865 (Sea of the Indies, Pondicherry, Macao).

*Dasyatis zugei* JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, 1901, p. 42 (Nagasaki).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 660, 1903 (Kobe, Tokyo, Wakanoura, Onomichi, Hiroshima).—JORDAN and SEALE, Proc. Davenport Acad. Sci., vol. 10, p. 2, 1905 (Hong Kong).—EVERMANN and SHAW, Proc. California Acad. Sci., ser. 4, vol. 16, p. 99, 1927 (Chefoo).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 102, 1928 (Bombay); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Japan, Indian Ocean); Hong Kong Nat., vol. 1, p. 180, 1930 (Indian Ocean; Japan).—SCHMIDT and LINDBERG, Bull. Acad. Sci. U.S.S.R., 1930, p. 1187 (Tsuruga).—FOWLER, List Fish. Malaya, p. 17, 1938 (reference).

*Dasybatus zugei* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 398, 1913 (Pinang, China, India, Japan, East Indies).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 13, fig. 10, 1929 (Amoy).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 14, 1931 (Nagasaki).—HORA and MUKERJI, Rec. Indian Mus., vol. 38, p. 18, 1936 (Maungmagan, Burma).

*Trygon crozieri* BLYTH, Journ. Asiatic Soc. Bengal, 1860, p. 45 (type locality: Lower Bengal).

Depth 23 to 25½ to end of tail; head 5 to 5½; disk length equals its width, 1½ to 1¾ in tail. Snout 1¼ to 1⅓ in head, extended in rather narrow acute triangle; eye 6 to 8½, 5¾ to 6 in snout, 3 in interorbital; dentary width 4½ in head; teeth in 24 rows in jaws, cusps low or obsolete; nostrils deep, simple, internarial equals dentary width; interorbital 2½ to 3¾ in head, level, fontanel depression little concave. Gill openings equidistant, subequal or last but little shorter. Spiracle much larger than eye, broad, deep, close below and along hind eye edge.

Skin smooth. Spine greater than interspiracle width or 1¾ in snout.

Dorsal as median cutaneous keel behind dorsal spine on tail; anal as slightly higher and longer keel on tail below; pectorals form quadrangular disk and rounded on outer angles and posteriorly; ventrals triangular, pointed.

Brown above, little paler marginally. Tail with dorsal and anal cutaneous folds dusky brown. Under surface of body whitish.

India, Burma, Malay Peninsula, Pinang, Singapore, East Indies, Cochinchina, China, Japan. The figure of Müller and Henle agrees

very well with my materials. Garman says with age "scattered tubercles in the vertebral series. Large individuals have a more or less complete median series, and have the tail roughened by small spines."

U.S.N.M. No. 50733. Onomichi, Bingo, Japan. Jordan and Snyder. Section of interocular region of skin, width, 66 mm.

U.S.N.M. No. 75871 and 75872. Japan ? P. L. Jouy. Length, 190-328 mm.

U.S.N.M. No. 75870. Japan ? P. L. Jouy. Length, 560 mm.

U.S.N.M. No. 51358. Kobe, Japan. Jordan and Snyder. Length, 730 mm.

#### DASYATIS MICROPS (Annandale)

*Trygon microps* ANNANDALE, Rec. Indian Mus., vol. 2, p. 393, pl. 27, 1908 (type locality: Bengal Bay off Chittagong, in 17 fathoms); Mem. Indian Mus., vol. 2, p. 26, text fig. 1, pl. 2, fig. 3 (denticles), pl. 3, fig. 1 (mouth), pl. 4, fig. 1, 1909 (types; off Orissa).

*Dasybatus microps* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 381, 1913 (copied).

Snout 3½ to 4½ in disk length, greater than interorbital, rounded, with small terminal projection covered with enlarged denticles; eyes very small, little prominent; mouth large, upper jaw slightly undulated, lower not undulate; coarsely digitate cutaneous flap hanging down from mouth roof; usually 5 short fingerlike processes on mouth floor, 3 in center joined together at base and one at either side; teeth white, transverse ridge very conspicuous in unworn teeth, part anterior slightly concave and considerably greater in area than that posterior, which convex.

Skin soft and delicate, without enlarged tubercles on disk, bearing numerous minute, spiny denticles, all with stellate bases; denticles larger on snout tip and region around eyes and spiracles than elsewhere, sometimes extending to ventral surface at pectoral edges. Tail toward base with much larger denticles, which largest on sides and only bear very short stellate spines on ventral surface; terminal part densely clothed with denticles similar to but smaller than those on sides of basal part.

Tail without cutaneous fins, not longer than disk, with broad flat basal part about half long as disk and slender cylindrical terminal part of about same length, with single massive spine at junction of 2 parts; very low ridge on ventral surface of terminal part; pectorals form rhombic disk, length little over 1¼ in width, outer angles rather greater than right angles.

White, dorsal surface of disk suffused with rose pink, without definite markings. Eyes dark. Tail gray above, becomes darker terminally. Length, 3,170 mm. (Annandale.)

India.

**DASYATIS JENKINSII (Annandale)**

*Trygon jenkinsii* ANNANDALE, Mem. Indian Mus., vol. 2, p. 28, text fig. 4-a, 1909  
(type locality: off Ganjam coast, India, 23–27 fathoms).

*Dasybatus jenkinsii* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 378, 1913  
(copied).

Head to hind spiracle edge  $3\frac{3}{4}$  in disk length. Snout  $1\frac{3}{5}$  in head to hind spiracle edge, as seen above snout sharply pointed in broad obtuse angle, not much produced; orbit  $4\frac{1}{8}$ ,  $2\frac{7}{8}$  in snout,  $2\frac{7}{8}$  in interorbital; mouth jaws feebly undulated; teeth white, practically uniform in size, each with low transverse ridge situated near hind edge and with distinct transverse depression in front; papillae on mouth floor 4, 2 median rather well separated; interorbital  $1\frac{1}{2}$  in head to hind spiracle edge. Spiracles close behind eye, subequal with orbit.

Skin fairly tough. Few enlarged rounded denticles in scapular region, followed posteriorly by single row of stout, short, retroverted spines with flat bases, row extending on tail to base of anterior spine; middle of back occupied by pavement of small, flat, round scales, gradually smaller towards periphery. Tail covered by small bluntly spinous tubercles. Pectorals and ventrals naked.

Tail cylindrical, without folds, not much longer than disk width, sometimes with 2 long, slender spines; pectorals form broad subquadrangular disk, length  $1\frac{1}{5}$  in its width which greatest just behind spiracles, outer angles rounded, front edges linear, hind edges convex.

Dorsal surface reddish olive, paler at edges of fins, without definite markings. Tail dark gray, mottled on ventral surface with brown and white at base. Ventral surface of disk dead creamy white. Length, 192 mm. (Annandale.)

India. According to Garman possibly a variety of *Dasyatis uarnak*.

**DASYATIS PONAPENSIS (Günther)**

*Trypon ponapensis* GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 493, 1910 (type locality: Kubary, Ponape, Carolines).

*Dasybatus ponapensis* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 380, 1913  
(copied).

*Dasyatis ponapensis* FOWLER, Mem. Bishop Mus., vol. 10, p. 24, 1928 (compiled);  
Proc. 4th (1929) Pacific Sci. Congr., Java, p. 50, 1930 (reference).

Head to hind edge of spiracle  $8\frac{1}{2}$  in total length. Snout  $1\frac{4}{5}$  in head to hind spiracle edge, as seen above broadly rounded with very slight prominence; eye 4,  $2\frac{2}{5}$  in snout, wide as orbital protrusion,  $1\frac{1}{2}$  in firm interorbital,  $3\frac{2}{3}$  across entire interorbital width; dental plates undulated; 4 papillae on mouth floor, as pair medially behind lower dental plate and 1 each side near mouth angle; internarial  $2\frac{1}{10}$  in preoral length, flap with entire edge; interorbital  $1\frac{1}{8}$

in head to hind spiracle edge. Interspiracle space  $1\frac{1}{4}$ , spiracle length little greater than orbit.

Skin smooth.

Tail long, whiplike, strong basally, tapering, without dermal folds, spine inserted little before first fifth its length,  $1\frac{1}{2}$  in head to hind spiracle edge; pectorals form circular disk, width slightly less than length, which  $1\frac{1}{5}$  in tail.

Uniform. Size not given, a young female. (Günther.)

Micronesia. Probably the young of the very variable *Dasyatis imbricatus*, though thought by Günther to differ in the presence of 4 papillae on the floor of the mouth.

#### DASYATIS UYLENBURGI Giltay

*Dasyatis uylenburgi* GILTAY, Mem. Mus. Roy. Nat. Hist. Belg., ser. 5, vol. 3, p. 13, figs. 3–6, 1933 (type locality; Poeloe Endoe, Aru Islands).

Disk width very slightly less than its length; snout  $3\frac{2}{3}$  in disk length to hind pectoral end; eye  $5\frac{2}{3}$  in snout, 3 in interorbital; mouth small,  $2\frac{1}{2}$  in preoral length; upper jaw curved and well undulated, upper teeth 33, lower 27, small, white, subtriangular, pointed; buccal papillae 3, two external ones much longer than median; interorbital 2 in snout; spiracle little longer than eye.

Scales of back form regular design from interorbital to base of tail, cordiform; on median line of tail row of 5 spiniform, lanceolate scutes.

Tail short,  $1\frac{1}{2}$  times longer than disk, armed with barbed spine above; upper and lower ridges little distinct, obsolete.

Disk above uniformly brown, paler toward edges. Below white.

Length of disk, 180 mm., disk width, 190 mm., tail, 280 mm. (Giltay.)

Aru Islands. Said to differ from *Dasyatis imbricatus* in dentition, the 3 buccal papillae inside the mouth, and the long continuous paved area of scutes on the back.

#### DASYATIS MARGINATUS (Blyth)

*Trygon marginatus* BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 38, 1860 (type locality: Lower Bengal).—DAY, Fishes of India, pt. 4, p. 738, 1878 (Blyth's example); Fauna British India, Fishes, vol. 1, p. 54, 1889.—ANNANDALE, Mem. Indian Mus., vol. 2, p. 30, text fig. 5, pl. 3, fig. 11 (mouth), 1909 (off Burma and Ganjam, 24 fathoms).—PEARSON, Ceylon Administr. Rep. 1915–18, p. F16.

*Trygon (Himantura) marginatus* DUMÉRIL, Nat. Hist. Elasmobr., vol. 1, p. 588, 1865 (Calcutta).

*Dasybatis marginatus* GARMAN, Mem. Mus., Comp. Zool., vol. 36, p. 378, 1913 (Burma, Ganjam, India).

*Trygon atrocissimus* BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 39, 1860 (type locality: Probably Indian Ocean (tail with spine)).

Head to hind spiracle edge  $9\frac{3}{4}$  in total length. Snout  $1\frac{1}{3}$  in head to hind spiracle edge, as seen above front profile obtusely rounded sometimes with short terminal projection; eye small, about 12 in head, 8 in snout,  $5\frac{1}{3}$  in interorbital; mouth rather small, lower jaw more distinctly undulated than upper, which nearly straight; teeth faintly tinged brown, unworn ones distinctly but minutely ridged longitudinally, strong transverse ridge with well-marked concavity on surface in front; two short papillae on mouth floor, one near each angle; interorbital  $1\frac{1}{8}$  in head to hind spiracle edge. Spiracle nearly twice large as eye, close behind eye, interspiracle width  $1\frac{1}{2}$  in head.

Skin delicate. Head and center of back covered with close-set, rounded, nearly flat denticles, on tail intermixed with stellate spines. On back denticles gradually smaller from middle outward and not forming clearly defined design; externally each side some with stellate bases, this marked on those on pectorals where somewhat arranged in longitudinal lines; extend to margin and sometimes over it on ventral surface.

Tail without folds and with single large caudal spine; pectorals form broad quadrangular disk, length  $1\frac{1}{3}$  its width or  $2\frac{1}{6}$  in tail, outer angles somewhat narrowly rounded, front edges nearly linear and hind edges only slightly convex; ventrals small.

Above gray, with distinct blackish tint and without any tinge of brown. Male with series of livid bluish marks running round disk at some little distance from margin. Tail blackish. Ventral surface white, with broad blackish margin laterally and posteriorly, sometimes indistinct. Length, 342 mm. (Annandale.)

India, Burma.

#### DASYATIS IMBRICATUS (Schneider)

*Raja imbricata* SCHNEIDER, Syst. Ichth. Bloch, p. 366, 1801 (type locality: Coromandel).

*Trygonobatus imbricatus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816 (name only).

*Trygon imbricata* CUVIER, Règne Animal, vol. 2, p. 136, 1817 (reference).—MÜLLER and HENLE, Syst. Beschreib. Plagiostomen, p. 164, 1841 (Coromandel; Java).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1407, 1849 (Pinang Sea, Singapore, Malay Peninsula).—BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Bangcallang and Kammal).—GRAY, List fish British Museum, p. 119, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 63, 1852 (Coromandel, Bengal); (Bengal), vol. 25, p. 9, 1853 [on *Isacurrah tenkee* Russell, Fishes of Coromandel, vol. 1, p. 3, pl. 4 (Vizagapatam), p. 24 (on McClelland), p. 82, 1803 (reference)].—BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 40, 1860 (Calcutta).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 481, 1870 (compiled).—DAY, Fishes of India, pt. 4, p. 739, 1878; Fauna Brit. India, Fishes, vol. 1, p. 52, 1889.—ANNANDALE, Mem. Indian Mus., vol. 2, p. 32, pl. 3, fig. 5, text fig. 6, 1909 (Puri on Orissa coasts).—PEARSON, Ceylon Administr. Rep., 1912–13, p. E13.—MALPAS, Ceylon Administr. Rep., 1921, p. E5.

- Trygon (Trygon) imbricatus* DUMÉRIL, Nat. Hist. Elasmobr., vol. 1, p. 606, 1865 (Coromandel; Pondicherry).
- Dasybatus imbricatus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 379, 1913 (East Indies).—SUVTI, Index Fish. Siam, p. 6, 1937 (Laem Sing; Sri-racha; Chonburi; Trat).
- Dasybatus (Himanturus) imbricatus* CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>o</sup> note, p. 6, 1926 (Gulf of Siam).
- Dasyatis imbricatus* FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 102, 1928 (Bombay); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 505, 1930 (Indian Ocean); Hong Kong Nat., vol. 1, p. 179, 1930 (Indian Ocean); Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 89, fig. 6, 1935 (Bangkok; Sriracha; Paknam); vol. 89, p. 128, 1937 (Paknam); List Fish. Malaya, p. 16, 1938 (reference).
- ? *Trygonobatus dorsatus* BLAINVILLE, Bull. Soc. Philomath. Paris, vol. 8, p. 112, 1816 (name only).
- Pastinaca dorsalis* SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 319, 1839 (on *Isacurrah tenkee* Russell).
- ? *Raia fluviatilis* BUCHANAN-HAMILTON, Fishes of Ganges, p. 1, 1822 (type locality: Kampur, Ganges River).
- Trygon immunis* BENNETT, Life of Raffles, p. 694, 1830 (type locality: Sumatra).
- Pastinaca brevicauda* SWAINSON, Nat. Hist. Animals, vol. 2, p. 319, 1839 (on *Tenkee shindraki* Russell, Fishes of Coromandel, vol. 1, p. 3, pl. 5, 1803, (type locality: Vizagapatam)).
- Dasybatus brevicauda* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 460 (Baram, North Borneo).
- Trygon walga* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 159 (not fig.) 1841 (type locality: India, Red Sea).—GRAY, List fish British Museum, p. 117, 1851 (Singapore).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 67, 1852 (Batavia, Samarang); (Bengal), vol. 25, p. 82, 1853 (reference); Nat. Tijds. Nederland. Indië, vol. 21, p. 136, 1860 (Muntok, Banka).—BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 40, 1860 (Calcutta).—KNER, Reise Novara, Fische, p. 420, 1865 (Singapore).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 475, 1870 (Bengal Bay, East Indies, Pinang, Java).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 409, 1876 (Singapore).—DAY, Fishes of India, pt. 4, p. 738, pl. 194, fig. 3, 1878.—PETERS, Monatsb. Akad. Wiss. Berlin, p. 926, 1880 (Ningpo).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 104, 1881 (Swatow).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 19, 1888 (Bombay, Madras, Singapore).—DAY, Fauna British India, Fishes, vol. 1, p. 55, 1889.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Buntal).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 161, 1907 (Gischin).—LLOYD, Rec. Indian Mus., vol. 1, p. 220 1907 (Akyab).—PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 4, 1912 (no locality).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E43, E45, E47 description, E48, E49.—PEARSON, Ceylon Administr. Rep., 1914, p. E4; 1915–18, pp. F9, F10, F11, F13.—MALPAS, Ceylon Administr. Rep., 1921, p. E8.—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 625, 1926 (Sarawak).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>o</sup> note, pp. 32, 175 (Hué), p. 77 (Saigon-Thaudaumot), 1929.
- Trygon (Himantura) walga* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 589, 1865 (Sea of the Indies, Ganges mouth, Java).
- Dasyatis walga* RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 57 (copied).

*Trygon ehindrakee* (Cuvier) BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 9, 1853 (on *Tenkee shindraki* Russell).

*Trygon heterurus* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 67, 1852 (type locality: Batavia); Nat. Tijds. Nederland. Indië, vol. 9, p. 395, 1855 (North Pasuruan, Java); vol. 20, pp. 238, 447, 1859-60 (Singapore).

*Trygon (Himantura) heterurus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 591, 1865 (compiled).

*Trygon polylepis* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 73, 1852 (type locality: Batavia); Versl. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 475, 1870 (Ceylon).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 680, 1871 (Red Sea).—PETERS, Monatsb. Akad. Wiss. Berlin, p. 447, 1876 (Mauritius; Seychelles).—BARTLETT, Sarawak Gaz., vol. 26, No. 366, p. 134, 1896 (Bunatal).

*Trygon (Himantura) polylepis* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 590, 1865 (compiled).

*Trygon polylepis* SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.

*Trygon dadong* BLEEKER, Nat. Tijds. Nederland, Indië, vol. 10, p. (348) 355, 1856 (type locality: Rio, Bintang).

*Trygon (Himantura) dadong* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 591, 1865 (Bintang).

*Leiobatus dadong* BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).

*Trygon nuda* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 476, 1870 (type locality: Singapore, India).

*Trygon nudus* MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 408, 1876 (Singapore).

*Himantura nuda* JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 42, 1901 ("Japan").

*Dasyatis nudus* FOWLER, List Fish. Malaya, p. 16, 1938 (reference).

*Raja obtusa* (Ehrenberg) KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 680, 1871 [type locality: Red Sea (name in synonymy)].

Snout produced, sharp angular point, slightly longer than preoral or nearly double interorbital; eye  $3\frac{1}{2}$  in interorbital; mouth width 3 in preoral length, little undulate; 2 oral papillae; teeth in about 32 rows in each jaw; interorbital  $1\frac{1}{8}$  in snout, slightly depressed medially. Spiracle large as eye.

Interorbital, short space before eyes, cranium and middle of back broadly covered with minute rough plates or tubercles; at disk center small spine and slight enlarged vertebral row to tail where about 9 down to caudal spines, posterior of which larger and  $2\frac{1}{4}$  in snout.

Tail without membranes; disk nearly wide as long, front edges little concave, broadly rounded at angles and behind; claspers moderate.

Uniform brown above, whitish below.

Red Sea, Mauritius, Seychelles, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Indo China, China.

1 example. A.N.S.P. Bombay, India. Dr. F. Hallberg. Disk to hind ventral ends, 238 mm., tail, 285 mm., disk width, 225 mm.

**DASYATIS GRANULATUS (Macleay)**

*Trygon granulata* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, pt. 4, p. 598, 1883 (type locality: New Guinea).

*Himantura granulata* WHITLEY, Rec. Australian Mus. vol. 16, p. 211, figs. 1-2, 1928 (type: Vanikoro, Santa Cruz Group); Journ. Pan-Pacific Res. Inst., vol. 3, No. 1, p. 11, 1928 (Santa Cruz Group).

*Dasyatis granulatus* FOWLER, Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).

*Dasyatis gerrardi* (not Gray) GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 377, 1913 (part).—FOWLER, Mem. Bishop Mus., vol. 10, p. 24, 1928 (part); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Head to hind spiracle edge  $7\frac{1}{4}$  in total length. Snout  $1\frac{1}{2}$  in head to hind spiracle edge as seen above meets at broadly obtuse angle; eye 5, 3 in snout,  $2\frac{1}{2}$  in interorbital; mouth width 3 in head to first gill opening; teeth lozenge-shaped, close-set in oblique series, each with cusp over its long axis; upper buccal flap fringed with about 21 points; 2 fairly large buccal papillae with rounded but somewhat frayed edges; interorbital 2 in head to hind spiracle edge. Spiracle close behind eye, little larger than eye.

Head, back, median line of tail to root of caudal spine evenly covered with thorny granules, which largest near median line, not forming median row or differing amongst themselves except in size. Similar minute granules over snout and on sides of pectorals. Scattered prickles stud long tail, smaller and disappearing before tip. Ventrals, under surface of disk, sides and lower surface of tail basally, smooth.

Tail filamentous (spine removed), without folds; pectorals form subcircular disk, width slightly less than its length, which  $1\frac{1}{2}$  in tail, outer angles widely rounded, hind edges convex and hind angles obtusely rounded; ventrals slightly longer than interorbital width.

Brown, lighter below. Margins of ventral surface smoky brown. At least 9 ill-defined, crescentic, brownish markings arched along middle of each pectoral, largely faded. Length, 865 mm. (Whitley.)

East Indies, Melanesia. The above is largely from Whitley's redescription and figure of Macleay's holotype of *Trygon granulata*. He also describes and figures a smaller one 751 mm. long from the Santa Cruz Group with "no ocelli" and therefore evidently without the crescentic markings on the pectorals in the holotype.

**Genus UROGYMNUS Müller and Henle**

*Urogymnus* MÜLLER and HENLE, Arch. Naturg., 1837, p. 434. (Type, *Raja asperima* Schneider, virtually. *Urogymnus* Müller and Henle proposed to replace *Gymnura* Müller and Henle.)

*Anacanthus* (not Gray 1831, Audinet-Serville 1832) (Ehrenberg) HOVEN, Handb. Dierk., vol. 2, p. 179, 1833. (Type, *Raja africana* Schneider.)

*Gymnura* (not Kuhl 1824) MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 117. (Type, *Raja asperima* Schneider, monotypic.)

*Rhachinotus* (not Gray 1831 or Serville 1832) CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 404, 1849. (Type, *Raja africana* Schneider, monotypic. *Rhachinotus* Cantor proposed to replace *Anacanthus* Müller and Henle.)

Body disciform, partly circular. Tail long, slender, tapers, without spine or fins other than narrow cutaneous subcaudal at some stages. No rostral cartilage. Mouth undulate, transverse. Teeth tessellated, flattened, rhomboid. Spiracles large, close behind eyes. Scales tubercular, with broad rounded to polygonal bases, varying in shape, size, and numbers with age. No dorsal. Pectorals meet at front of disk, margins and angles rounded. Ventrals short, wide.

#### UROGYMNUS AFRICANUS (Schneider)

*Raja africana* SCHNEIDER, Syst. Ichth. Bloch, p. 367, 1801 (type locality: Guinea).

*Anacanthus africanus* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 157, 1841 (Red Sea; Guinea).

*Rhachinotus africanus* CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1404, 1849 (Pinang).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 65, 1852 (Red Sea; Guinea); Nat. Tijdschr. Nederland, Indië, vol. 4, p. 514, 1853 (Batavia).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 374, 1913 (Indian Ocean; East Indies).—CHEVEY, Inst. Oceanogr. Indochine, 19<sup>o</sup> note, p. 7, 1932 (Cochinchina).

*Urogymnus africanus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 581, 1865 (copied).—OGILBY, Mem. Queensland Mus., vol. 5, p. 88, 1916 (Darnley Island).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference); List Fish. Malaya, p. 18 (246), 1938 (reference).

*Raja asperrima* SCHNEIDER, Syst. Ichth. Bloch, p. 367, 1801 (type locality: Indian Ocean, Bombay).

*Raja asperrimus* MÜLLER and HENLE, Ann. Mag. Nat. Hist. Charlesworth, vol. 2, p. 90, 1838 (name).

*Urogymnus asperrimus* GRAY, List fish British Museum, p. 115, 1851 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 580, 1865 (Seychelles).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 471, 1870 (India, Pinang, Africa, Seychelles).—JOUAN, Mém. Soc. Imp. Sci. Nat. Cherbourg, ser. 2, vol. 5, p. 106, 1870 (Seychelles).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 684, 1871 (Red Sea).—DAY, Fishes of India, pt. 4, p. 736, pl. 195, fig. 1, 1878 (Madras Museum).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 312, 1880 (Cape York); vol. 6, p. 376, 1881 (Cape York).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 18, 1888 (Kingsmill Islands).—DAY, Fauna Brit. India, Fishes, vol. 1, p. 48, fig. 20, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 243 (Muscat).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, 1903, p. 193, 1904 (Kuala Langat).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 37, pl. 3, fig. 8 (mouth), pl. 5, figs. 2-2a, 1909 (off Chittagong Island); vol. 3, p. 3, 1910.—SOUTHWELL, Ceylon Administr. Rep., 1912-13, pp. E47 (descriptive) E49.—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Oman).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 602, fig. 123, 1913 (Lumu-Lumu, Borneo Bank).—PEARSON, Ceylon, Administr. Rep. 1915-18, p. F13.—TIRANT, Service Océanogr. Pêches Indo-

Chine, 6<sup>e</sup> note, p. 76, 1929 (Cholon).—FOWLER, Mem. Bishop Mus., vol. 11, no. 5, p. 314, 1931 (reference).—SUVATTI, Index Fish. Siam, p. 5, 1937 (Ko-Chang).

*Urogyrus asperimus* PEARSON, Ceylon Administr. Rep., 1915–18, p. F12 (error). *Anacanthus asperimus* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 157, pl. 60, figs. 5–7, 1841 (India).

*Urogymnus rhombicus* KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 683 1871 (type locality: Koseir, Red Sea).

*Urogymnus laevoir* ANNANDALE, Mem. Indian Mus., vol. 2, p. 37, 1909 (type locality: Malpe, South Canara on Malabar Coast).

Head to hind spiracle edge 8½ in total length. Snout 2 in head to hind spiracle edge; eye 5, 2½ in snout, 4 in interorbital; mouth waved, inner buccal fold fringed, 3 to 5 oral papillae on mouth floor; teeth blunt, broader than long, in 48 rows; front nasal valves confluent, fringed posteriorly; interorbital 1½ in head to hind spiracle edge. Spiracle close behind and larger than eye, interspiracle 1¼ in head to hind spiracle edge.

Scales tubercular, unequal, more or less striated, with rounded bases where not in contact, with polygonal bases where crowded and with cusps short to long, acute, blunt or rounded to depressed and shovel-shaped.

Tail long, tapering, with or without narrow fold below according to age; pectorals form suboval disk, more pointed backward and with slight prominence at snout end, width 1½ in its length, which equals tail or 2 in tail length; ventrals well covered by pectorals.

Yellowish to whitish on tubercles, skin dark brown where exposed. (Day; Garman.)

Red Sea, Arabia, East Africa, Seychelles, India, Ceylon, Malay Peninsula, Pinang, East Indies, Indo China, Queensland, Melanesia. According to Annandale the disk length reaches 1,125 mm.

#### Genus UROLOPHUS Müller and Henle

*Urolophus* MÜLLER and HENLE, Sitz. Ber. Akad. Wiss., Berlin, p. 17, 1837. (Type, *Raja cruciata* Lacépède.)

*Leiobatus* (not Walbaum or Rafinesque) BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816. (Type, *Leiobatus sloani* Elainville, designated by Jordan and Evermann, Genera of Fishes, pt. 1, p. 95, 1917.)

*Trygonoptera* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 174, 1841. (Type, *Raja testacea* (Banks) Müller and Henle, monotypic.)

Disk partly quadrangular, narrower behind, front edges waved, meeting at blunt angle in front, outer and hinder angles rounded. Tail shorter than body, stout, with spine. Snout little produced. Papillae at mouth floor. A small dorsal variably present or absent. Caudal short, moderately deep, rounded behind. Ventrals short, broad, front and hind rays subequal, directed back.

## ANALYSIS OF SPECIES

<i>a<sup>1</sup>. UROLOPHUS.</i>	Tail short, length less than half its space from mouth.	
<i>b<sup>1</sup>.</i>	No tubercle on shoulder girdle.	
<i>c<sup>1</sup>.</i>	Back uniform brown-----	<i>aurantiacus</i>
<i>c<sup>2</sup>.</i>	Back with dark vertebral streak-----	<i>sufflavus</i>
<i>c<sup>3</sup>.</i>	Back with dark transverse and longitudinal markings-----	<i>cruciatus</i>
<i>b<sup>2</sup>.</i>	Back spinose, tubercle on shoulder girdle; brown with more or less scattered round dark spots-----	<i>armatus</i>
<i>a<sup>2</sup>. TRYGONOPTERA.</i>	Tail longer than its space from mouth.	
<i>d<sup>1</sup>.</i>	Hind edge of internasal valve with narrow fringe or lobules; nostrils without broad hind lobes.	
<i>e<sup>1</sup>.</i>	Papillae behind lower jaw numerous, close together.	
<i>f<sup>1</sup>.</i>	Snout would form right angle; back pale brown, closely specked with small brownish white dots-----	<i>bucculentus</i>
<i>f<sup>2</sup>.</i>	Snout would form very blunt angle; back dark brown, with numerous small or pale spots-----	<i>javanicus</i>
<i>e<sup>2</sup>.</i>	Papillae behind lower jaw fewer, widely spaced.	
<i>g<sup>1</sup>.</i>	Disk slightly broader than long; back uniform-----	<i>viridis</i>
<i>g<sup>2</sup>.</i>	Disk much wider than long.	
<i>h<sup>1</sup>.</i>	Back uniform-----	<i>kaianus</i>
<i>h<sup>2</sup>.</i>	Back with dark cross bars-----	<i>expansus</i>
<i>d<sup>2</sup>.</i>	Hind edge of internarial valves broadly fringed; nostrils with broad posterior lobes-----	<i>testaceus</i>

Subgenus *UROLOPHUS* Müller and Henle*UROLOPHUS AURANTIACUS* Müller and Henle

*Urolophus aurantiacus* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 173, pl. 56, 1841 (type locality: Gotto Island, southwest coast of Japan).—SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 307, 1850.—GRAY, List fish British Museum, p. 126, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Gotto; China); Nederland. Tijdschr. Dierk., vol. 2, p. 68, 1865 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

*Pastinaca jeinorii* (Bürger) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 173, 1841 (name in synonymy).

*Urolophus cruciatus* (not Lacépède) DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 626, 1865 (part).

*Urolophus fuscus* GARMAN, Proc. U. S. Nat. Mus., vol. 8, p. 41, 1865 (type locality: East coast Nippon, Japan).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 657, 1903 (Tokyo, Kobe, Hiroshima, Hakata, Wakanoura).—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 460, 1906 (Kagoshima).—PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 640, 1908 (Japan).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Tokyo).—JORDAN and THOMPSON, Mem. Carnegie Mus., vol. 6, p. 208, 1914 (Osaka).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus., Vertebrata, p. 187, 1920 (Misaki).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 115, 1925 (Yokohama, Toba, Misaki, Kagoshima Bay).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (Japan).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 14, 1931 (Misaki).

*Urolophus tullbergi* NYSTRÖM, Bihang Svenska Vet.-Akad. Handl., vol. 13, pp. 4, 53, 1887 (type locality: Nagasaki).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).

Depth 10 to 13½ to end of caudal; head 4 to 4⅔; disk length 1 to 1½ in its width; tail 1⅓ to 1½ in disk length. Snout 1½ to 1¾ in head, forms narrow triangular point in front; eye 4¼ to 5¾, 2¾ to 3⅔ in snout, 2⅓ to 2⅔ in interorbital; dentary width 2½ to 3¼ in head; teeth in 28 to 30 rows in jaws, each with rather narrow triangular cusp; upper lip with fringed edge, lower with rather large pleats; nostrils small, internarial width 1½ in dentary; interorbital 1¼ to 1⅔ in head. Gill openings small, equidistant, last shortest. Spiracles quite large, deep, wide, equal about 1⅓ eye diameters.

Skin smooth. Caudal spine 1¾ to 2⅔ in head.

No dorsal or anal; caudal moderately deep and rounded, its greatest expansion about equals spiracle; pectorals form partly quadrangular disk, broadly rounded; ventrals broad, obtuse; claspers flattened though robust, compressed, about half head length.

Back and above uniform brown. Below whitish, outer edges of disk broadly brownish.

Japan, Korea. I follow McCulloch's suggestion in placing *Urolophus fuscus* Garman as a synonym of the present species.

U.S.N.M. No. 50735. Wakanoura, Japan. Jordan and Snyder. Length, 128 to 260 mm. 2 examples.

U.S.N.M. No. 71829. Tokyo market. Albatross collection 1906. Length, 350 mm.

#### UROLOPHUS SUFFLAVUS Whitley

*Urolophus sufflavus* WHITLEY, Australian Zool., vol. 5, p. 354, 1929 (on *Urolophus aurantiacus* McCulloch, 1916).

*Urolophus cruciatus* (not Lacépède) WAITE, Mem. Australian Mus., vol. 4, pt. 1, p. 43, 1899 (Shoalhaven Bight and Jervis Bay); Mem. New South Wales Nat. Club, No. 2, p. 10, 1904.

*Urolophus aurantiacus* (not Müller and Henle) McCULLOCH, Biol. Res. Endeavour, vol. 4, pt. 4, p. 172, pl. 49, 1916 (off Manning River to Port Kemblon, New South Wales, in 20–84 fathoms); Fishes of New South Wales, ed. 2, p. 12, pl. 3, fig. 39a, 1927.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference; part).

Head to hind spiracle edge 5½ in total length. Snout 1½ in head to hind spiracle edge; eye 5⅓, 3¾ in snout, 2½ in interorbital; mouth width 2⅓ in preoral length; teeth pavementlike in female, each with elongate flattened spine in male; median papilla behind lower jaw, which subdivided into 2 to 4 lobes, another simple or bifurcate one each side and one near each angle of jaws; internarial 2⅔ in preoral length, hind outer angles of lobe separated from hinder margin as

small rounded tubercles, fimbriate hind edge little sinuous; nostrils large, confluent with mouth and separated by thick median frenum; interorbital 2 in head to hind spiracle edge. Spiracle along and behind eye, about equals  $1\frac{3}{5}$  eye diameters.

Tail  $1\frac{1}{2}$  in disk length, width between ventrals subequal with mouth, spine  $1\frac{3}{5}$  in head to hind spiracle edge, inserted about first  $\frac{2}{5}$  in tail below disk; caudal begins above directly behind spine end, below middle of its length on lower surface and width subequal variably with internarial; pectorals form more or less rounded disk, front margins almost straight from snout to broadly rounded outer angles, hind lateral edges convex, form obtuse angles with inner edges; ventral edges convex, angles rounded.

Rich ochreous yellow above when fresh, sometimes stained with pink toward disk edges. Indefinite brown median dorsal stripe may extend from eyes to dorsal spine. White below, purplish toward edges. Width, 387 mm. (McCulloch.)

New South Wales. Apparently differs from the Japanese *Urolophus aurantiacus* in the dark median dorsal stripe.

#### **UROLOPHUS CRUCIATUS (Lacépède)**

*Raja cruciata* LACÉPÈDE, Ann. Mus. Hist. Nat. Paris, vol. 4, pp. 201, 210, pl. 55, fig. 2, 1804 [type locality: New Holland (Australia)].—MÜLLER and HENLE, Mag. Nat. Hist. Charlesworth, vol. 2, p. 90, 1836 (name only).

*Leiobatus cruciatus* BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 121, 1816 (name only).

*Urolophus cruciatus* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 626, 1865 (Australia, Port Western, Tasmania).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 485, 1870 (Port Arthur).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 378, 1881 (Port Arthur).—JOHNSTON, Proc. Roy. Soc. Tasmania, 1882, p. 141, 1883; 1890, p. 39, 1891.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 21, 1888 (Port Jackson).—MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 14, 1911 (Bass Strait).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 408, 1913 (Hobart, Tasmania).—WAITE and MCCULLOCH, Trans. Roy. Soc. South Australia, vol. 39, p. 460, 1915 (Great Australian Bight, in 22–140 fathoms).—MCCULLOCH, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 171, 1916 (Bass Strait, off Port Davey, Mainwaring Cove, Bay of Fires, Tasmania; Investigator Group, South Australia; in 37–88 meters).—WAITE, Rec. South Australian Mus., vol. 2, p. 32, fig. 45, 1921.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr. Java, p. 503, 1930 (reference).

*Urolophus ephippiatus* RICHARDSON, Voy. *Erebus* and *Terror*, Fishes, p. 35, pl. 24, 1846 (type locality: Storm Bay, Van Diemens Land).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 627, 1865 (copied).

*Trygonobatus ephippiatus* GRAY, List fish British Mus., p. 126, 1851 (reference).

Depth  $9\frac{1}{8}$  to  $13\frac{1}{5}$  to end of caudal; head  $4\frac{2}{3}$  to  $4\frac{9}{10}$ ; disk length 1 to  $1\frac{1}{10}$  in its width; tail  $1\frac{1}{4}$  to  $1\frac{2}{3}$  in disk length. Snout  $1\frac{1}{2}$  to  $1\frac{3}{5}$  in head, forms broad, obtuse point for very wide angle of front profile line; eye  $5\frac{2}{5}$  to  $6\frac{1}{2}$ , 4 to  $4\frac{1}{4}$  in snout,  $2\frac{3}{5}$  to 3 in interorbital; dentary width  $4\frac{4}{5}$  in head; teeth in 18 to 20 rows in jaws, wider than

long, with slight transverse concavity on crown; both lips with fringed edges; nostrils small, internarial width subequal with dentary width; interorbital  $2\frac{1}{5}$  to  $2\frac{1}{4}$  in head, level. Gill openings small, subequal, equidistant, first and last shorter. Eye  $1\frac{3}{5}$  of large spiracle.

Skin smooth. Caudal with 2 spines, near end of tail, second longer or  $1\frac{1}{2}$  in head.

No dorsal or anal; caudal moderately deep, end rounded; pectorals form partly quadrangular disk, broadly rounded; ventrals broad, obtuse; claspers flattened though robust, obtusely conic, little less than total ventral length.

Uniform brownish above. Below whitish, outer portions of pectorals laterally, also of ventrals and all of caudal dusky.

New South Wales, Victoria, South Australia, Tasmania.

U.S.N.M. No. 39989. Port Jackson. Australian Museum. Length, 530 mm.

U.S.N.M. No. 39993. Port Jackson. Australian Museum. Length, 470 mm.

U.S.N.M. No. 40008. Port Jackson. Australian Museum. Length, 420 mm.

#### UROLOPHUS ARMATUS Müller and Henle

*Urolophus armatus* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 174, 1841 (type locality: New Ireland).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 628, 1865 (type).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 485, 1870 (copied); Journ. Mus. Godeffroy, pt. 17, p. 495, 1910 (copied).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 407, 1913 (New Ireland).—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Snout somewhat pointed and prominent; mouth waved; teeth flat. Above with small asperities on rostral cartilages, along back and row on tail; strong tubercle on shoulder girdle.

Tail scarcely shorter than disk; pectorals form rhomboid, orbicular disk, rather wider than long, front edges rectilinear, angles and hind edges rounded.

Brown, with numerous round black spots. Belly white, edges darker. Length, 175 mm. (Müller and Henle; Duméril.)

New Ireland.

#### Subgenus TRYGONOPTERA Müller and Henle

##### UROLOPHUS BUCCULENTUS Macleay

*Urolophus bucculentus* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 9, p. 172, 1884 (type locality: Outside Port Jackson, in 40–60 fathoms).—OGILBY, Cat. Fish. Australian Mus., vol. 1, p. 21, 1888 (types; off Barranjoey, Port Jackson).—WAITE, Fisher. Rep. *Thetis*, p. 41, 1898 (Nelsons Bay at Port Stephens, New South Wales).—McCULLOCH, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 177, 1916 (Bass Straits, in 70–100 fathoms); McCULLOCH, Proc. Linn. Soc. New South Wales, vol. 46, pt. 4, p. 466, pl. 41, figs. 1–3, 1921 (east of Botany Bay, in 60 fathoms); Fishes of New South Wales, ed. 2, p. 13, 1927.

*Trygonoptera bucculenta* WAITE, Mem. Australian Mus., vol. 4, pt. 1, p. 44, pl. 5, text fig. 3 (preoral region), 1899 (New South Wales).—STEAD, Fishes of Australia, p. 233, 1908.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 410, 1913 (Australia).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

Depth 13 to end of caudal fin (caudal fin broken); head  $3\frac{1}{2}$ ; disk length  $1\frac{1}{4}$  its width; tail (end cut off) apparently about half disk length. Snout  $1\frac{3}{5}$  in head; eye 8,  $5\frac{1}{5}$  in snout, 3 in interorbital; dentary width  $3\frac{2}{5}$  in head; teeth in 24 rows in jaws, rhombic, crowns convex; nostrils large, internarial width equals dentary width; interorbital  $2\frac{3}{5}$  in head, generally depressed with median depression. Gill openings small, subequal, equidistant, last smallest. Spiracles large, twice eye, wide and deep.

Skin smooth. Caudal spine large,  $4\frac{3}{4}$  in disk length.

Single small dorsal, length 2 in interorbital, close before base of caudal spine; caudal fin moderate; pectoral broad, front edge slightly emarginate, angles broadly convex; ventrals broad, half of head, ends obtuse.

Brown above, nearly uniform. Below whitish.

New South Wales. Garman gives the teeth in about 18 rows.

U.S.N.M. No. 39979. Port Jackson. Australian Museum. Length, 620 mm. to end of broken tail.

#### UROLOPHUS JAVANICUS (Martens)

*Trygonoptera javanica* MARTENS, Monatsb. Akad. Wiss. Berlin, p. 260, 1864 (type locality: Batavia).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 410, 1913 (Batavia).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

*Urolophus (Trygonoptera) javanica* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 486, 1870 (copied).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Batavia).

Snout tip forms blunt angle, length twice mouth width; mouth weakly waved; teeth in pavement; 3 oral papillae. Spiracle close behind eye, pointed oval, edges entire, equals  $1\frac{1}{8}$  eye diameters.

Skin smooth.

Tail shorter than disk; spine on tail with 20 denticles each side; upper fold on tail wider behind than lower, which extends forward nearly opposite insertion of caudal spine; low half heart-shaped dorsal on tail; disk rounded, somewhat longer than wide, front edge weakly convex, hind edges strongly convex.

Above dark brown, with numerous small, pale or dark spots. Below pale reddish gray. Paired fins on under sides dark brown, colored with radiations. Length, 338 mm. (Martens.)

East Indies.

**UROLOPHUS VIRIDIS McCulloch**

*Urolophus viridis* McCULLOCH, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 176, pl. 51, 1916 (type locality: Off Sandon Bluffs, New South Wales to Bass Straits, Tasmania, in 10–100 fathoms); Fishes of New South Wales, ed. 2, p. 13, 1927.

*Urotrygon viridis* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Head to hind spiracle edge  $4\frac{3}{4}$  in total length. Snout  $1\frac{1}{2}$  in head to hind spiracle edge, as seen above forms short broad triangular point; eye  $5\frac{1}{2}$ , 4 in snout,  $2\frac{1}{2}$  in interorbital; mouth width  $2\frac{1}{5}$  in preoral length; median teeth with flattened cusps in male; fimbriate lip behind upper jaw, several variously disposed widely spaced papillae behind lower; internarial  $2\frac{2}{5}$  in preoral length, hind edge of valve with narrow lobulate border not fringed, outer hind angles form papillae in groove outside lips; nostrils without large free lobes, posteriorly overhanging mouth angle; interorbital  $2\frac{2}{5}$  in head to hind spiracle edge. Spiracle  $3\frac{1}{2}$ , close along behind eye, inner edge without angular projection.

Tail depressed,  $1\frac{1}{3}$  in disk length, with well-developed fold each side, width between ventrals equals mouth width; spine inserted midway in tail, length  $1\frac{1}{5}$  in head to hind spiracle edge and sometimes with small anterior tubercle though no dorsal fin; caudal large, narrow, width  $\frac{4}{5}$  internarial, begins below hind part of spine on upper tail surface and extends forward as ridge to beneath front part of spine below; pectorals form rhomboidal disk, length  $1\frac{1}{5}$  its width, front edges slightly sinuous or almost straight with rounded outer angles, hind lateral edges little convex and junction with inner edges rounded; ventrals broad.

Light moss green above, extreme disk edges whitish. Iris golden. Lateral folds of tail and lower surfaces porcelain white, disk margins purplish. Back changes purplish brown after death, sometimes with broad blackish bar across interorbital and extending outward either side of eye. Width, 275 mm. (McCulloch.)

Tasmania, New South Wales.

**UROLOPHUS KAIANUS Günther**

*Urolophus kaianus* GÜNTHER, Rep. Voy. *Challenger*, vol. 1, pt. 6, p. 37, 1880 (type locality: Ki Islands, in 129 fathoms); vol. 22, p. 12, 1887 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 409, 1913 (copied).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Snout not projecting.

Disk entirely smooth.

Tail little shorter than disk; no dorsal; disk much broader than long, front edges meet at very obtuse angle.

Uniform brownish. Length, 235 mm. (Günther.)

Ki Islands.

**UROLOPHUS EXPANSUS McCulloch**

*Urolophus expansus* McCULLOCH, Biol. Res. *Endeavour*, vol. 4, pt. 4, p. 178, fig. 2 (on p. 200), 1916 (type locality: Great Australian Bight, in 80-120 fathoms).—WAITE, Rec. South Australian Mus., vol. 2, p. 33, fig. 47, 1921.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 503, 1930 (reference).

Head to hind spiracle edge  $4\frac{3}{5}$  in total length. Snout  $1\frac{1}{2}$  in head to hind spiracle length, as seen above forms broad obtuse angle with very short point; eye  $4\frac{1}{2}$ , 3 in snout,  $1\frac{4}{5}$  in interorbital; mouth width  $2\frac{1}{6}$ ; 2 or more papillae on median line of mouth behind lower jaw and several others widely spaced on either side; internarial  $2\frac{1}{5}$ , hind outer angles of valve forms small rounded tubercles, hind edge fimbriate; nostrils large, narrow, without skinny lobe posteriorly; interorbital  $2\frac{2}{5}$ . Spiracle along and behind eye, length  $3\frac{2}{3}$ .

Tail depressed, with narrow keel on either side, length  $1\frac{2}{5}$  in disk length, width between ventrals subequal to that of mouth; spine inserted slightly before middle in tail length,  $1\frac{1}{2}$  in head to hind spiracle edge, without dorsal fin; caudal narrow, width less than internarial, begins below spine end on upper surface of tail and extends farther forward below; pectorals form widely rounded disk, length  $1\frac{1}{6}$  its width, front edges nearly straight to rounded outer angles and hind edges feebly convex and form obtuse angles at junctions with inner edges; ventrals subquadangular, angles rounded.

Drab gray above, with 2 faint plumbeous cross bars on hinder part of head and oblique bar on either side of disk anteriorly. Width, 208 mm. (McCulloch.)

Great Australian Bight. Said to differ from *Urolophus kaianus* in the variegated color pattern, though as this is described from formalin material in the above species, this character requires confirmation.

**UROLOPHUS TESTACEUS (Müller and Henle)**

*Trygonoptera testacea* (Banks) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 174, pl. 56, 1841 [type locality: New Holland (Australia)].—GRAY, List fish British Museum, p. 126, 1851 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 629, 1865 (Australia).—WAITE, Mem. Australian Mus., vol. 4, p. 44, 1899 (New South Wales); Mem. New South Wales Nat. Club, No. 2, p. 10, 1904.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1907, p. 419, 1908 (Victoria).—STEAD, Edible Fishes New South Wales, p. 119, 1908; Fishes of Australia, p. 233, 1908.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 410, 1913 (Australia).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 504, 1930 (reference).

*Raja testacea* (Banks) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 174, 1841 (name in synonymy).

*Urolophus testaccus* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 486, 1870 (Sydney, Cape Upstart, Australia).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 315, 1880 (Cape Upstart, Port Jackson); vol. 6, p. 379, 1881 (Cape Upstart, Port Jackson).—OGILBY, Cat. Fishes New South Wales, 1886, p. 6; Cat. Fishes Australian Mus., vol. 1, p. 21, 1888 (Port Jackson, Port Phillip).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (Port Phillip).—WAITE, Prelim. Rep. *Thetis* Exped., p. 40, 1898 (New South Wales).—TOSH, Marine Biol. Rep. Queensland, pl. 5, fig. 3, 1903 (Jumpin Pin).—OGILBY, Commerc. Fish Fisher. Queensland, 1915, p. 45 (Moreton Bay).—McCULLOCH, Biol. Res. *Endeavour*, vol. 4, p. 174, pl. 50, 1916 (5 miles southwest of Fraser Island and Port Hacking in 15 fathoms).—OGILBY, Mem. Queensland Mus., vol. 5, p. 86, 1916 (Jumpin Pin, Cape Moreton, South Hill, Low Bluff, Double Island Point).—WAITE, Rec. South Australian Mus., vol. 2, p. 32, fig. 46, 1921.—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925.—McCULLOCH, Fishes New South Wales, ed. 2, p. 12, pl. 3, fig. 39b, 1927.

*Trygon testacea* ZIETZ, Trans. Roy. Soc. South Australia, vol. 32, p. 292, 1908.

*Trygon mulleri* (not Castelnau) STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 53, pt. 1, p. 479, pl. 6, fig. 4 (young), 1866 (Port Jackson, Australia).

*Trygon henlei* (not Castelnau) STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 53, pt. 1, p. 479, pl. 6, fig. 4 (half grown), 1866 (Port Jackson).

*Trygon australis* (not Castelnau) STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 53, pt. 1, p. 480, pl. 7, 1866 (South Seas).

Head to hind spiracle edge  $5\frac{2}{3}$  in total length. Snout  $1\frac{1}{2}$  in head to hind spiracle edge, as seen above ends in very short obtuse point; eye  $5\frac{3}{4}$ , 4 in snout,  $2\frac{3}{4}$  in interorbital; mouth width  $2\frac{1}{4}$  in preoral length; teeth pavementlike, each with horizontal ridge in female, which elevated into obtuse spine in male; fimbriate lip behind upper jaw, median fimbriae largest; median bilobed papilla behind lower jaw, with 1 or 2 smaller each side; large free posterior nasal lobes overhanging mouth angles; internarial valve with broad free fringe of flattened tentacles, 14 on each side and outer external angles form small papillae hidden in mouth; internarial  $2\frac{3}{4}$  in preoral length; interorbital 2 in head to hind spiracle edge. Spiracles along and behind eye, 4 in head to hind spiracle edge.

Tail depressed, without lateral folds, width between ventrals equals mouth width, length slightly less than disk length; caudal spine inserted about midway in tail length,  $1\frac{1}{3}$  in head to hind spiracle edge; dorsal long as eye, inserted close before caudal spine; caudal width  $\frac{2}{3}$  internarial, begins below hind fourth of caudal spine above and below extends forward nearly opposite dorsal; pectorals form rhomboidal disk, slightly broader than long front edges slightly sinuous or nearly straight from snout to broadly rounded outer angles, hind lateral edges convex, junction with inner edges rounded; ventrals broad.

Uniform cinnamon brown above, including eyes and tail. Extreme disk edges and caudal white. Below white with broad pale brown margin to pectorals and ventrals. Large examples darker brown, intramarginal parts of disk and caudal blackish. Width, 322 mm. (McCulloch.)

South Australia, Victoria New South Wales, Queensland.

#### Genus ANACANTHOBATIS Von Bonde and Swart

*Anacanthobatis* VON BONDE and SWART, Fisher. Marine Biol. Surv. South Africa, Rep., No. 3, 1922 errata slip, 1924. (Type, *Leiobatis marmoratus* VON BONDE and SWART, monotypic.)

Body and head form subcircular or partly rhomboid disk, little wider than body. Tail shorter than disk, tapering, without lateral folds or serrated spine. Pair of cutaneous flaps on mouth roof. Teeth in numerous rows, rounded, blunt or pointed. Skin smooth. No dorsal. Caudal very small. Ventrals notched, male with claspers.

#### ANACANTHOBATIS MARMORATUS (Von Bonde and Swart)

*Leiobatis marmoratus* VON BONDE and SWART, Fisher. Marine Biol. Surv. South Africa, Rep. No. 3, 1922, p. 18, pl. 23, 1924 (type locality: Natal coast in 160 fathoms).—BARNARD, Ann. South African Mus., vol. 21, p. 79, 1925 (Natal coast).

? *Leiobatis dubius* VON BONDE and SWART, Fisher. Marine Biol. Surv. South Africa, Rep. No. 3, 1922, p. 19, 1924 (type locality: South Africa).

Head to hind spiracle edge  $4\frac{3}{4}$  in total length. Snout  $1\frac{1}{4}$  in head to hind spiracle edge, tip extends in short soft point; eye  $5\frac{3}{4}$ ,  $4\frac{2}{3}$  in snout,  $2\frac{2}{5}$  in interorbital; mouth width 3 in preoral length to base of rostral filament; teeth small, blunt, in numerous rows, bases round; pair of arclike fringed flaps suspended inside mouth from top jaw, seen when mouth opened; nostrils large, close to mouth corners and continuous along very shallow nasoral grooves; 2 broad fringed flaps from inner nasal edges overhang mouth corners and grooves and outer nasal edges extended into 2 tubular, projecting, fringed flaps; interorbital  $2\frac{3}{5}$  in head to hind spiracle edge, concave. Spiracle close behind and slightly less than eye.

Above smooth, also below. Dark red papillalike projections of skin sparsely scattered over upper surface, including ventrals.

Tail rounded, thin, tapering,  $1\frac{1}{3}$  in disk length, no lateral folds; caudal rudimentary as small vertical thin fold or ridge; pectorals form subcircular disk in female, nearly quadrangular to rhombic in male, but very slightly broader than long; ventrals deeply notched, completely joined along inner edges with tail, infused outer edges serrated or denticulated.

Reddish brown, profusely mottled above with very small white spots, also scattered, pale, faintly brown ocelli. Length, 245 mm. (Von Bonde and Swart.)

South Africa. *Leiobatus dubius* based on an example but 102 mm., is said to have the same coloration as the above and its slight alleged structural characters are hardly distinctive.

#### Genus UROLOPHOIDES Soldatov and Lindberg

*Urolophoides* (Lindberg) SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 24, 1930. (Type, *Urolophoides giganteus* (Lindberg) Soldatov and Lindberg, orthotypic.)

Disk much broader than long, longer than tail. Greatest disk width opposite first  $\frac{2}{5}$  of disk length as measured from snout tip to hind edge of pectorals. Tail short, stout, tip blunt, length about  $\frac{4}{5}$  of disk length. Upper part of tail covered with numerous small prickles; 2 strong spines at base of tail and 2 at first basal third; 2 needles, large, near middle of tail. No dorsal or caudal fins. Vertical membranous fold on upper surface of tail. Skin of disk smooth, except hind parts of pectorals and ventrals.

Related to *Urolophus* in general appearance, but differs in the absence of the caudal fin. It resembles *Dasyatis* in the membranous caudal fold, but differs in its short, stout, nonwhiplike tail.

#### UROLOPHOIDES GIGANTEUS Soldatov and Lindberg

*Urolophoides giganteus* (Lindberg) SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 26, fig. 4, 1930 (type locality: Peter the Great Bay).—TARANETZ, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 52, fig. 29, 1937.

Snout longer than interorbital width or space between spiracles,  $\frac{3}{4}$  in disk length as measured to hind pectoral edge. Eye  $\frac{2}{3}$  of spiracle, or  $5\frac{1}{2}$  in interorbital; combined eye and spiracle  $2\frac{1}{2}$  in snout. Mouth width 2 in preoral length. Ventrals extend but slightly behind hind ends of pectorals. Caudal needles slightly longer than interorbital space, very strong, serrated, inserted behind middle of tail.

Total length, 2,320 mm., disk width, 1,780 mm. (Soldatov and Lindberg.)

Peter the Great Bay.

#### Genus GYMNURA Kuhl

*Gymnura* KUHL, Algemein Konst Letterbode, May, 1823, p. 316; Bull. Sci. Nat. Féruccac, vol. 2, p. 90, 1824. (Type, *Raja micrura* Schneider, monotypic.)

Precludes *Gymnura* Lesson 1827, Horsfield and Vigors 1827, Nuttall 1834.)

*Aetoplatea* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 175, 1841. (Type, *Actoplatea tentaculata* Müller and Henle, monotypic.)

*Aëtoplatia* AGASSIZ, Nomencl. Zool., Index, p. 10, 1846. (Type, *Aetoplatea tentaculata* Müller and Henle.)

*Actoplatea* SCUDDER, Nomencl. Zool., Univers. Index, p. 8, 1882. (Type, *Aetoplatea tentaculata* Müller and Henle.)

*Pteroplatea* MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 117.  
 (Atypic.) (Type, *Raja altavela* Linnaeus, virtually affixed by Jordan and  
 Gilbert, U. S. Nat. Mus., Bull. 16, p. 46, 1883.)

*Planerocephalus* GRATZIANOW, Zool. Anz., 1906, pp. 400, 403. (Type, *Planero-*  
*cephalus ellioti* Gratzianow=*Raja micrura* Schneider, monotypic.)  
 (Monstrosity.)

Disk much wider than long, lozenge shaped, angles rounded, de-  
 pressed and thin. Tail short, slender, with or without narrow  
 dermal folds behind serrated spine. Head not prominent. Eyes  
 small, prominent. Mouth wide, transverse, little arched; jaws  
 slender. Teeth minute, numerous, in broad band, each tooth with  
 wide base, with 1 to 3 sharp cusps. Nostrils wide, separated by  
 broad isthmus; front valves confluent, crossing isthmus as narrow  
 fold; posterior valves rudimentary. Spiracles large, close behind  
 eyes. No dorsal fin. Pectorals wide, meeting in front of head.  
 Ventrals small, narrow.

Temperate and tropical seas.

#### ANALYSIS OF SPECIES

- a<sup>1</sup>. AETOPLATEA.* Usually small dorsal fin at base of tail before caudal spine.
- b<sup>1</sup>.* Tentacle behind spiracle; tail less than half of body----- *tentaculata*
- b<sup>2</sup>.* No tentacle behind spiracle; tail about half as long as body----- *zonura*
- a<sup>2</sup>. GYMNURA.* No dorsal fin.
  - c<sup>1</sup>.* Tail nearly long as body----- *poecilura*
  - c<sup>2</sup>.* Tail half long as body.
    - d<sup>1</sup>.* Chin without 2 denticles.
      - e<sup>1</sup>.* Uniform brown above----- *japonica*
      - e<sup>2</sup>.* Two large white blotches above----- *bimaculata*
    - d<sup>2</sup>.* Chin with pair of wide-set denticles----- *crooki*
    - c<sup>3</sup>.* Tail less than half long as body----- *micrura*

#### Subgenus AETOPLATEA Valenciennes

##### GYMNURA TENTACULATA (Müller and Henle)

*Aetoplatea tentaculata* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 175, 1841 (type locality: Red Sea, Malabar).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 630, 1865 (types).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 411, 1913 (Red Sea, Indian Ocean, Malabar).

*Pteroplatea tentaculata* GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 488, 1870 (copied).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 40, pl. 4, fig. 4, 1909 (off Hughli River mouth, Orissa and Ganjam coasts, in 15–30 fathoms).

*Pteroplatea australis* RAMSAY and OGILBY, Proc. Linn. Soc. New South Wales, vol. 10, p. 575, 1885 (type locality: Cape Hawke, New South Wales).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 10, p. 466, 1885 (no description); Cat. Fishes Australian Mus., pt. 1, p. 22, 1888 (type; Broken Bay); Ann. Queensland Mus., No. 9, p. 5, 1908 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 88, 1916 (Moreton Bay, off Port Curtis and Cape Gloucester, 14–25 fathoms; note).—MCCULLOCH, Australian Zool., vol. 1, pt. 4, p. 89, pl. 1, fig. 3, 1917 (Tuggerah Lakes, New South Wales).—

MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—MCCULLOCH, Fishes New South Wales, ed. 2, p. 13, pl. 3, fig. 40a, 1927.

*Pteroplatea natalensis* GILCHRIST and THOMPSON, Ann. South African Mus., vol. 11, p. 56, 1911 (type locality: Natal); Ann. Durban Mus., vol. 1, p. 288, 1916 (reference).—VON BONDE and SWART, Fisher. Marine Biol. Surv. South Africa Rep., No. 3, 1922, p. 17, 1924 (reference).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 81, 1925 (Natal).

Head to hind spiracle edge  $5\frac{3}{4}$  in total length. Snout  $1\frac{5}{8}$  in head as seen above with short point in broad obtuse profile; orbit 4,  $2\frac{1}{2}$  in snout,  $3\frac{1}{2}$  in interorbital; interorbital  $1\frac{1}{5}$  in head. Tentacle at hind angle of spiracle variable in length, always slender and pointed.

Tail variable, usually less half as long as disk in adult, sometimes with faint dorsal and anal cutaneous folds; serrated spine minute or absent; dorsal about twice long as high, more than half long as inner ventral edge and its front border nearer base than terminal ends of ventrals; pectorals form disk little less twice as broad as long in adult, more than twice as broad in young, angles somewhat rounded in both.

Young greenish slate above, marked with irregular roundish spots of dark brown and with faint and close reticulation of paler shade of brown. This reticulation separates closely set roundish areas of ground color. With age brown spots enlarge and assume greenish color, finally become dark olive and occupy greater part of surface. Faint reticulation disappears and large spots and blotches of yellowish green develop. Tail faintly barred at all ages. Adult above without minute dark dots and faint markings of tail. Young white below, with age marbled and clouded darker. Reaches disk width of 730 mm. (Annandale.)

Red Sea, South Africa, India, Australia. In depths of 15 to 30 fathoms. I am unable to find satisfactory distinctive characters in the descriptions of the nominal *Pteroplatea australis* Ramsay and Ogilby and *Pteroplatea natalensis* Gilchrist and Thompson, the latter only based on a young male but 280 mm. wide with a nonserrate caudal spine and undeveloped teeth.

U.S.N.M. No. 39978. Cape Hawke. Australian Museum. Length, 440 mm.

#### GYMNURA ZONURA (Bleeker)

*Aetoplatea zonurus* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 79, 1852 (type locality: Batavia, Java).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 631, 1865 (copied).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 411, 1913 (Singapore and Batavia).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference).

*Pteroplatea zonura* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 488, 1870 (type).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 40, pl. 4, fig. 3, 1909 (Puri, Orissa coast, in 15–20 fathoms).

Head to hind spiracle edge 7 in total length. Snout  $1\frac{1}{3}$  in head to hind spiracle edge, as seen above with short though distinct point in convex profile; orbit 5, 3 in snout,  $4\frac{1}{2}$  in interorbital; nasal flap nearly straight, barely fringed; interorbital nearly equals head to hind spiracle edge.

Tail variable, often more than half as long as disk; serrated spine minute or absent, and low cutaneous fold sometimes present on under surface of tail; dorsal twice long as high, about  $\frac{1}{3}$  long as free part of pectorals and front border slightly placed before hind border of pectorals.

Olive-green above, minutely and closely speckled with darker dots, boldly marked with large round or irregular spots of greenish yellow and often joined together by irregular lines and blotches of same color, sometimes ocellate. In young dark spots paler and less numerous, while spots less irregular and of brownish color. Ventral surface without pigment. Tail white below with row of large longitudinally oval blackish spots above. Reaches disk width of 850 mm. (Annandale.)

India, Singapore, East Indies.

Subgenus **GYMNURA** Kuhl

**GYMNURA POECILURA** (Shaw)

*Raja poecilura* SHAW, General zoology, vol. 5, p. 291, 1804 [on *Tenkee kunsal* Russell, Fishes of Coromandel, vol. 1, p. 4, pl. 6, 1803 (type locality: Vizagapatam)].

*Trygon poecilurus* BENNETT, Life of Raffles, p. 694, 1830 (Sumatra).

*Pteroplatea poecilura* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 412, 1913 (Red Sea, India, Calcutta, Pinang, Java).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>e</sup> note, p. 6, 1926 (Gulf of Siam).—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference).

*Pteroplatea poeciloura* FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 102, 1928 (Bombay) (error).

*Gymnura poecilura* FOWLER, List Fish. Malaya, p. 18, 1938 (reference).

*Gymnura micrura* (not Schneider) KUHL, Algemein Konst Letterbode, p. 316, 1823 (Java).

*Pteroplatea micrura* MÜLLER and HENLE, Syst. Beschr. Plagiost., p. 169, 1841 (India).—RICHARDSON, Ichth. China Japan, p. 197, 1846 (China and Java Seas, Indian Ocean, Red Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 409, 1849 (part).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. (65) 76, 1852 (Batavia and Samarang); (Bengal), vol. 25, p. 9 (on *Tenkee kunsal* Russell), p. 24 (on Mc Clelland), p. 25, 1853 (reference).—DUMÉRII, Hist. Nat. Elasmobr., vol. 1, p. 613, 1865 (Sea of the Indies, mouth of Ganges).—DAY, Fishes of Malabar, p. 278, 1865.—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 487, 1870 (Calcutta, Pinang, Singapore, India).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Bangkok).—DAY, Fishes of India, pt. 4, p. 741, pl. 194, fig. 2, 1878; Fauna British India, Fishes, vol. 1, p. 56, fig. 23, 1889.—VOLZ, Nat. Tijdschr. Nederland Indië, vol. 66, p. 241, 1907 (Sumatra).—ANNANDALE, Mem. Indian Mus., vol. 2,

p. 39, 1909 (Puri).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E43–E45, E49.—PEARSON, Ceylon Administr. Rep., 1915–18, pp. F11–F14.  
*Pteroplatea micrurus* BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Nagasaki, China, East Indies, Malacca, Bengal, Red Sea); Nat. Tijdschr. Nederland. Indië, vol. 21, p. 136, 1860 (Muntok, Banka).

*Dasyatis micrura* GRAY, List fish British Museum, p. 122, 1851 (Calcutta, India, Singapore).

*Dasyatis microura* BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 37, 1860 (Calcutta).

*Pastinaca kunsal* CUVIER, Règne animal, ed. 2, vol. 2, p. 400, 1829 (on *Tenkee kunsal* Russell).

*Pteroplatea annulata* SWAINSON, Nat. Hist. Animals, vol. 2, p. 319, 1839 (on *Tenkee kunsal* Russell).

*Raia pastinaca* var. *altavela* (not Linnaeus) LICHTENSTEIN, Descr. Anim. Forster, p. 256, 1844 (Tanna, Society Islands).

Head greatly depressed; snout about  $1\frac{1}{6}$  in interorbital; eye  $5\frac{1}{2}$ ; mouth width  $1\frac{1}{5}$ ; teeth in about 40 rows in each jaw; internasal space  $1\frac{1}{3}$  in width; interorbital flat, with broad median depression, greater than interspiracle width. Spiracle larger than eye, without tentacle.

Skin smooth.

No dorsal; tail without dorsal folds, without caudal spine; disk length  $1\frac{9}{10}$  in width.

Brown above. Iris gray. Tail whitish, with 9 broad blackish bands much wider than pale interspaces.

Red Sea, India, Ceylon, Pinang, Singapore, East Indies, Siam, China, Japan, Polynesia.

1 example. A.N.S.P. Bombay, India. Dr. F. Hallberg. Disk length, 153 mm., tail, 90 mm., disk width, 285 mm.

#### GYMNURA JAPONICA (Schlegel)

*Pteroplatea japonica* SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 309, pl. 141, 1850 (type locality: Nagasaki Bay).—BLEEKER, Act. Soc. Sci. Indo-Néerl. (Japan), vol. 2, p. 45, 1857.—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 614, 1865 (copied).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 42, 1901 (reference).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 662, 1903 (Wakanoura).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 401, 1912 (Tokyo).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 413, 1913 (Japan).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 187, 1920 (Boshiu).—CHABANAUD, Service Océanogr. Pêches Indochnine, 1<sup>o</sup> note, p. 6, 1926 (Cambodia).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (Japan).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 15, 1931 (Nagasaki).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 274, fig. 26, 1932 (Chefoo).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 170, figs. 14–14a, 1932 (Tsingtao).—WANG, Contrib. Biol. Lab. Sci. Soc. China, vol. 9, No. 3, p. 112, 1933 (Chekiang).—TANAKA, Jap. Fish. Life Colours, No. 34, 1933.

*Dasyatis micrura* var. *japonicus* GRAY, List fish British Museum, p. 122, 1851  
(Japan, China).

*Pteroplatea hirundo* (not Lowe) ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 60, 1897.—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, pl. 5, fig. 6 (teeth), 1932 (Tsingtao).

Depth 12 to 12½ to end of tail; head 4 to 4¼, disk length 1½ to 1¾ in width; tail length to base 2½ to 2¾ in disk length. Snout 1⅔ to 1⅓ in head forms very slight angle to obtusely conic front profile of disk; eye 6 to 8 in head, 4 to 5 in snout, 5 to 5½ in interorbital; mouth width 1½ to 2 in head; teeth in 30 to 40 rows in jaws, each with sharp, triangular denticle; nostril broad, oblique, internarial width 1⅓ to 1⅔ in mouth width; front nasal valve broad, low lobe, hind valve short fold extending half way to internarial; interorbital 1½ to 1¾ in head, broad, level, with broad median fontanel forming concave depression. Gill openings small, equidistant, last shortest. Spiracles large, broad, transverse; eye 1¼ to 1½ in spiracle.

Skin smooth. Small caudal spine long as spiracle, or shorter.

No dorsal or anal; tail slender, conic, tapers to firm, slender point; pectoral wide lobe, front edge little undulate, hind edge little convex, apex obtuse; ventral small, broad, 2½ to 2¾ in head; claspers short, depressed, firm points, reach hind ventral edge.

Above uniform umber. Tail whitish, with 6 black blotches above, wider than pale interspaces. Under surface of disk whitish.

China, Japan, Korea.

U.S.N.M. No. 75878. Japan ? P. L. Jouy. Length, 223–260 mm. 2 examples.

U.S.N.M. No. 75879. Japan ? P. L. Jouy. Length, 200 mm.

U.S.N.M. No. 71902. Tokyo market. *Albatross* collection 1906. Length, 220 mm.

#### GYMNURA BIMACULATA (Norman)

*Pteroplatea bimaculata* NORMAN, Ann. Mag. Nat. Hist., ser. 9, vol. 16, p. 270, 1925 (type locality: Yenting, Chekiang Province, China).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (copied); Hong Kong Nat. vol. 1, p. 182, 1930 (compiled).

*Pteroplatea micrura* (not Schneider) RICHARDSON, Ichth. China Japan, p. 197, 1846 (China Seas).

*Pteroplatea jordani* CHU, China Journ., Shanghai, vol. 12, No. 6, p. 357, pl. 1930 (type locality: Ning-po fish market; East Sea, China).

According to Norman closely related to *Pteroplatea japonica* Schlegel, but with the anterior margins of the disk less undulated and the tail a little shorter; pair of large, ovate, bluish white spots separated by distance equal twice interorbital width, their anterior edges level with the hinder margins of the spiracles. Greatest width, 365 mm., length from snout tip to vent, 170 mm., from vent to tail end, 87 mm.

## GYMNURA CROOKI Fowler

## FIGURE 12

*Gymnura crooki* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 241, fig. 6, 1933 (type locality: Kowloon, China).

Depth 14 to end of tail; head 4½; disk length 1½ its width; tail 2 in disk length. Snout 1¾ in head, forms short blunt end of wide obtuse angle of front profile; eye 9 in head, 6 in snout, 5½ in interorbital; mouth width 2 in head; teeth in 65 rows above, 45 below, each tooth with 1 to 3 slender cusps of which median largest; nostril broad, oblique, internarial 3½ in mouth width, front valve broad lobe, hind valve low short fold extending halfway to internarial; interorbital 1¾ in head, broad, nearly level except concave depression due to broad fontanel. Gill openings small, last smallest, equidistant. Spiracle large, oblique, deep, twice eye.

Skin smooth. No caudal spine.

No dorsal. Scarcely an anal developed, unless low rudimentary ridge on tail below. Tail rather robust, flexible, tapers to rather strong point. Pectoral wide lobes, front edge little concave and hind edge little convex, apex broadly convex. Ventral small, long, with claspers conic, rather large and along inner edge of ventral long as its outer edge, which 2 in head.

Back uniform dusky brown. Below whitish. Tail light or pale brownish, irregularly blotched or spotted above with dark brown, like back, only about half of blotches crossing over lower surface of tail narrowly and of more pale tint than above.

My specimen differs from Schlegel's plate of *Pteroplatea japonica* in that it not only has no trace of a caudal spine and no trace of any removal of such, could it have been present, but also the coloration of the tail is very different. Schlegel's figure shows the tail as whitish with 5 black, well-contrasted transverse bands, the terminal 3 of which are clearly wider than the pale interspaces. My specimen also shows a hard knoblike denticle on the lower jaw each side of the middle and projecting, each of these knobs about opposite the limit of the internarial space.

## GYMNURA MICRURA (Schneider)

*Raja micrura* SCHNEIDER, Syst. Ichth. Bloch, p. 360, 1801 (type locality: "Surinam" [likely erroneous]).

*Trygonobatus micrurus* BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 112, 1816 (name only).

*Pteroplatea micrura* CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1409, 1849 (Pinang, Malay Peninsula, Singapore).—DAY, Fishes of Malabar, p. 278, 1865.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Buntal and Moratabas).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 194, 1904 (locality?).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 461

(Baram, North Borneo).—VOLZ, Nat. Tijdschr. Nederl. Indië, vol. 66, p. 241, 1907 (Sumatra).—LLOYD, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—PELLEGRIN, Ann. Mus. Zool. Univ. Napoli, new ser., vol. 3, No. 27, p. 5, 1912

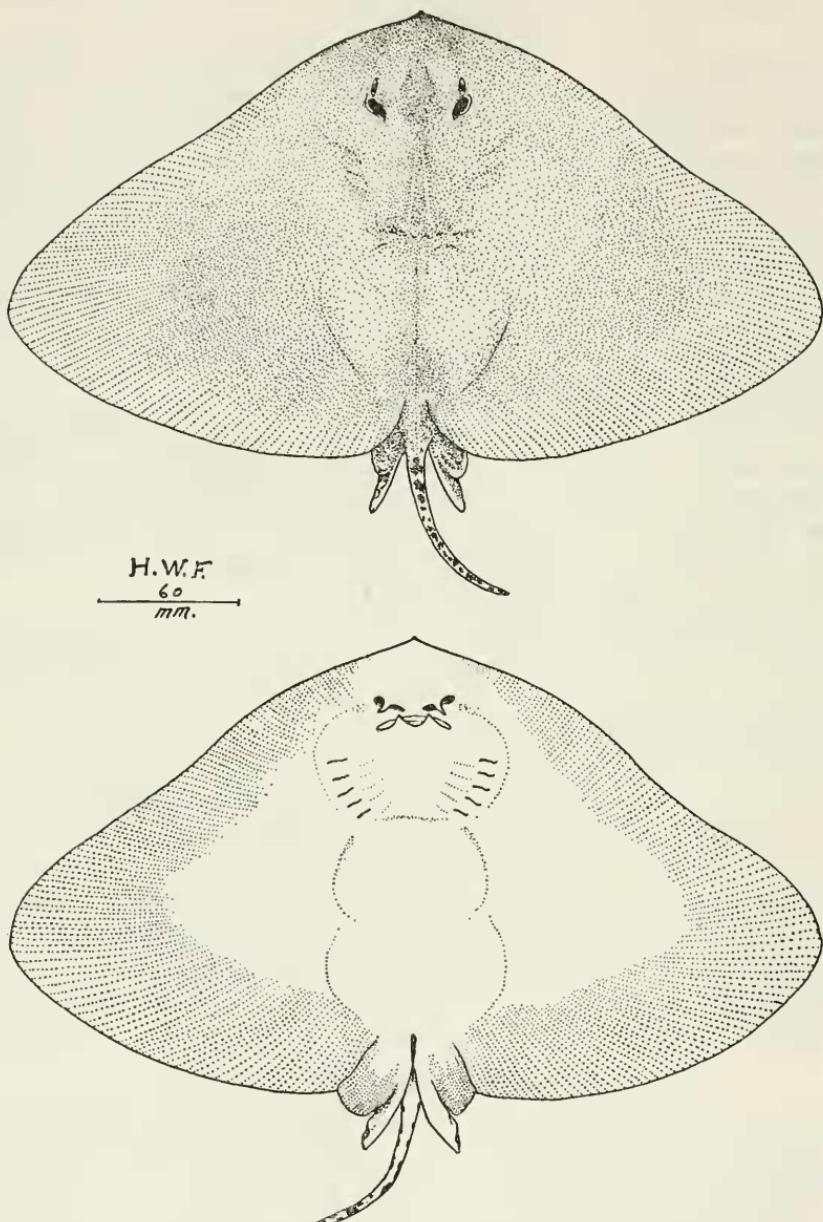


FIGURE 12.—*Gymnura crooki* Fowler: Type (U.S.N.M. No. 6830).

(Singapore).—PEARSON, Ceylon Administr. Rep., 1912-13, p. E11.—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 8, 1913 (Mekran).—PEARSON, Ceylon Administr. Rep., 1914, p. E5.—JORDAN and STARKS, Ann. Carnegie Mus., vol. 2, p. 430, 1917 (Ceylon).—VINCIGUERRA,

*Ann. Mus. Civ. Stor. Nat. Genova*, ser. 3, vol. 10, p. 625, 1926 (Sarawak).—  
*PILLAY*, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).—  
*TIRANT*, Service Océanogr., Pêches Indo-Chine, 6° note, p. 78, 1929 (Phuroc  
hai).—*BORODIN*, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (no  
locality).—*FOWLER*, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930  
(East Indies).—*CHEVEY*, Inst. Océanogr. Indochine, 19° note, p. 7, 1932  
(Cochinchina).—*SUVATTI*, Index Fish. Siam, p. 5, 1937 (Laem Sing;  
Sriracha; Maenam Cau Phaya).

*Gymnura micrura* FOWLER, List Fish. Malaya, p. 17, 1938 (reference).

*Ceratoptera chrenbergii* (not Müller and Henle) DAY, Fishes of India, pt. 4,  
p. 745, fig. 1878 (type locality: Madras). (Monstrosity.)

*Astrapo dipterygia* (not Schneider) DAY, Fishes of India, Suppl., p. 812, 1888  
(same example).

*Pteroplatea hirundo* (not Lowe) ELERA, Cat. Fauna Filip., vol. 1, p. 621, 1895  
(Manila, Luzon).

♀ *Planerocephalus ellioti* GRATZIANOW, Zool. Anz., 1906, pp. 403, 404. [Madras,  
Indian Ocean (on Day; monstrosity).]

Depth  $15\frac{1}{2}$  to end of tail; head  $4\frac{1}{3}$ , disk length  $1\frac{7}{8}$  in its width; tail length to base 3 in disk length. Snout  $1\frac{3}{5}$  in head, forms blunt end of wide, obtuse angle of front profile; eye  $7\frac{1}{5}$  in head, 5 in snout, 5 in interorbital; mouth width  $1\frac{3}{4}$  in head; teeth 60 to 65 rows, each with short pointed cusp; nostril broad, oblique, internarial  $1\frac{2}{5}$  in mouth width, front valve broad low lobe, hind valve short, fold extending halfway to internarial; interorbital  $1\frac{1}{2}$  in head, broad, level, with board median fontanel forming concave depression. Gill openings small, equidistant, last shortest. Spiracles large, broad; eye  $1\frac{3}{4}$  in spiracle.

Skin smooth. No caudal spine.

A small rudimentary dorsal long as eye. No anal. Tail slenderly conic, tapers to rather firm point. Pectoral wide lobe, front edge slightly undulate, hind edge little convex, apex obtuse. Ventral small, broad, 2 in head.

Back nearly uniform blackish brown. Tail with end broadly blackish and two blackish saddles above, below whitish. Under surface uniformly whitish, slightly brownish or soiled on pectorals apically.

Arabian Sea, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Indo China, Philippines.

U.S.N.M. No. 39978. Cape Hawke. Australian Museum. Length, 440 mm.

### Family MYLIOBATIDAE

Body, head, and pectorals form lozenge-shaped disk. Tail long, slender, whiplike and usually with basal serrated spine. Eyes prominent, lateral. Teeth angular, broad, flat, tessellated, median series commonly wider than laterals, if any. Spiracles large, behind eyes, opening laterally. Cranium prominent. Tail often with small dor-

sal on basal portion. Pair of rostral fins, joined in front of snout, either separated from pectorals or connected with them at side of head.

Large sting rays of tropical or subtropical seas, feeding chiefly on mollusks, which they crush with their large grinding teeth, though usually less of bottom dwellers than the true rays. In moving through the water they seem to appear as if flying or soaring. Aquarium specimens have been known to utter a rather loud bellowing noise when taken from the water. Like the sting rays, these creatures are also dreaded for their murderous spines on the tail, so they are usually removed by the fishermen. All the known genera represented by fossils.

#### ANALYSIS OF GENERA

a<sup>1</sup>. **MYLIORATINAE.** Snout in single lobe; pelvis arched.

*b*<sup>1</sup>. Teeth in more than 3 rows in each jaw.

*c*<sup>1</sup>. Side of head not free from pectorals----- **Holorhinus**

*c*<sup>2</sup>. Side of head free from pectorals.

*d*<sup>1</sup>. No caudal spine----- **Aetomylus**

*d*<sup>2</sup>. Caudal spine present----- **Myliobatis**

*b*<sup>2</sup>. Teeth in 1 row in each jaw----- **Aetobatus**

*a*<sup>2</sup>. **RHINOPTERINAE.** Snout in 2 separate lobes; pelvis greatly arched.

**Rhinoptera**

#### Genus **HOLORHINUS** Gill

*Holorhinus* GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 331. (Type *Rhinoptera vespertilio* Girard, monotypic.)

*Myliobatis* (not Geoffroy Saint-Hilaire) (Duméril) CUVIER, Règne animal, vol. 2, p. 13, 1817. (Type, *Raja aquila* Linnaeus, designated by Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 50, 1883.)

*Myliobates* SCHINZ, Thierreich Cuvier, vol. 2, pt. 19, pp. 234, 832, 1822.—(Berthold) LATREILLE, Nat. Fam. Tierr., p. 108, 1827. (Type, *Raja aquila* Linnaeus.)

? *Ictactius* RAFINESQUE, Analyse de la nature, p. 93, 1815. (Atypic, nomen nudum.)

? *Ptychopleururus* AGASSIZ, Rech. Poiss. Fossiles, vol. 3, p. 67, 1837; Poissons fossiles, vol. 3, pl. 45, figs. 1–3, 1838. (Type, *Ptychacanthus* (*Ptychopleururus*) *faujasii* Agassiz, monotypic, fossil.)

*Bates* PROBST, Würtemberg's Jahrest., vol. 33, p. 88, 1877. (Type, *Bates spectabilis* Probst, monotypic, fossil.)

Disk wide. Tail long, slender, whiplike, strong retrorsely serrated spine above base and behind dorsal. Head moderately prominent. Eyes lateral. Teeth hexangular, flat, tessellated, in 7 rows, median wider, laterals narrow. Front nasal valves confluent in broad flap with free edge before mouth and joined by frenum to upper jaw. Spiracles lateral. Skin smooth. Dorsals small, between ventrals. Pectorals slender, falciform, continue along side of head to snout end where joined to form simple lobe. Ventrals short, wide, not emarginate.

All warm seas. Numerous fossils, mostly flat dental plates, known from the Cretaceous and Tertiary. Ovoviparous. The following imperfectly described nominal species not seen since originally described:

HOLORHINUS RHOMBUS (Basilewsky)

*Myliobatis rhombus* BASILEWSKY, Nouv. Mém. Soc. Nat. Moscou, vol. 10, p. 250, 1855 (type locality: Pekin).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 434, 1913 (copied).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference); Hong Kong Nat., vol. 1, p. 185, 1930 (compiled).

Head truncate; mouth transverse; teeth tetragonal, smooth, broad, in pavement. No dorsal; tail long, filiform, rough with sharp tubercles; pectorals fleshy, acutely and prominently pointed, form rhomboidal disk; ventrals 2, fleshy, broad, end behind disk. Above brown, white below. Disk width, 535 mm., length, 508 mm., tail, 458 mm. (Basilewsky.)

ANALYSIS OF SPECIES

- a<sup>1</sup>.* Snout short, broad, rounded.
- b<sup>1</sup>.* Dorsal origin more than 2 lengths of base behind ventral bases.
- c<sup>1</sup>.* Median upper teeth 4 to 6 times broad as long above; brown.
  - d<sup>1</sup>.* Orbital horn longer; snout little pointed----- *aquila*
  - d<sup>2</sup>.* Orbital horn shorter; snout more pointed----- *cervus*
- c<sup>2</sup>.* Median upper teeth 1½ to 2½ times broad as long.
  - e<sup>1</sup>.* Purple above----- *hamlynii*
  - e<sup>2</sup>.* Yellowish olive-brown above, with 26 to 28 large irregular light-blue spots----- *australis*
- b<sup>2</sup>.* Dorsal origin 1 base length behind ventral bases; yellowish olive above, with blue transverse bars on head and across disk----- *tenuicaudatus*
- a<sup>2</sup>.* Snout elongate, pointed; dorsal origin 1½ lengths of base behind ventral bases; light brown, young with many lighter or reddish spots, most distinct posteriorly----- *tobijei*

HOLORHINUS AQUILA (Linnaeus)

*Raja aquila* LINNÆUS, Syst. Nat., ed. 10, vol. 1, p. 232, 1758 (type locality: Mediterranean Sea); ed. 12, vol. 1, p. 396, 1766.

*Myliobatis aquila* GRAY, List fish British Museum, p. 128, 1851 (reference).—GUICHENOT, Notes île Réunion, vol. 2, p. 32, 1863.—REGAN, Ann. Natal Gov. Mus., vol. 1, pt. 3, p. 242, 1908 (Bird Island, Natal).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 475 (Bonaparte material).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 3, p. 288, 1916 (reference).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 82, pl. 4, fig. 7, 1925 (Walfish and Table Bays, Indian Ocean).

*Myliobates aquila* SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891 (reference).

*Myliobatis noctula* BONAPARTE, Icon. Fauna Ital., Pesci, vol. 3, pt. 2, fasc. 2, descr., pl., fig., 1833 (type locality: Italy).

Snout 1½ to 2 in head; mouth width 2⅓ to 2¾; internarial 2⅞ to 3⅓; preoral length 1⅔ to 2; front ventral edge 1 to 1½; dorsal length 3 to 4¼; ventral width 1⅓ to 1⅓. Disk length, 125 to 225 mm., width, 219–347 mm., tail, 292–408 mm.

A.N.S.P. Nos. 410-413. Italy. C. L. Bonaparte (No. 217). All females. Cotypes of *Myliobatis noctula*.

HOLORHINUS CERVUS (J. L. B. Smith)

*Myliobatis cervus* J. L. B. SMITH, Rec. Albany Mus., vol. 4, p. 169, fig. 1, 1935  
(type locality: Knysna; Cape Agulhas; Bushman River; Port Alfred; Great Fish Point).

Disk  $1\frac{3}{4}$  times wide as long. Pectoral tips moderately pointed, subfalcate. Snout not very blunt, rounded, with apical point. Flanges on side of head, connecting rostrals with pectorals, very narrow. Circular flap of iris projecting over most of pupil from above. Males with small conical horn above orbit. Central series of teeth 4 to 5 times wide as long.

Skin smooth, no tubercles.

Dorsal small, projects beyond hind edge of base, originates 3 to  $3\frac{1}{2}$  lengths of base behind posterior part to margin of ventral base, 1 to  $1\frac{1}{2}$  lengths of base behind end of ventral. Males with 2 serrated caudal spines, posterior longer, females with 1 or 2 spines. Caudal  $1\frac{1}{2}$  to 2 times long as disk.

Color uniform brown.

Length of female up to 4 feet (1,220 mm.) across disk, male usually much smaller. (J. L. B. Smith.)

South Africa. Females differ from *Holorhinus aquila* in the shape of the snout, somewhat more pointed in *H. cervus*, and this the only apparent difference in the female. Orbital horn of *H. cervus* very slight. "Full specific distinction of *cervus* from *aquila* is perhaps of doubtful validity, since the females of these species cannot easily be distinguished one from another."

*Holorhinus cervus* differs from the related *H. tobijei* in the wider disk and in the more posterior insertion of the dorsal.

HOLORHINUS HAMLYNI (Ogilby)

*Myliobatis hamlyni* OGILBY, Ann. Queensland Mus., No. 10, p. 40, 1911 (type locality: Moreton Bay, Queensland); Mem. Queensland Mus., vol. 5, p. 89, 1916 (Moreton Bay; note).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (compiled).

Head length  $2\frac{3}{4}$  in disk length from snout tip to hind angle of vent. Snout  $4\frac{3}{4}$  in disk length, tip broadly rounded; eye  $2\frac{2}{3}$  in snout length,  $2\frac{2}{5}$  in firm interorbital,  $4\frac{1}{10}$  in interocular; mouth width  $1\frac{1}{2}$  in snout length, upper jaw with 6 and lower 9 series of dental plates, each of 7 teeth, as wide transverse median which gradually increases in width from front and 3 small laterals directed outward and backward and of equal size throughout; in upper jaw with first median wide as and last  $2\frac{1}{5}$  times 3 lateral teeth; in lower jaw first half wide as, third wide as, and last twice wide as

lateral 3, fifth median lower tooth  $2\frac{3}{5}$  times wide as long; internarial frenum smooth, hind edge of flap truncate and coarsely fringed, tips of fringes lobate and front nasal angle nearer middle of flap than snout tip; interorbital fontanel deepest and widest anteriorly, greatest width  $2\frac{1}{3}$  its length; interocular 3 in disk length. Spiracle wide, slightly oblique, extends outward forward to hind lower angle of orbit, inner opening wider than eye diameter. Gill openings narrow, subequal.

Body smooth.

Dorsal fin begins behind ventral tips, its vertical height  $1\frac{1}{2}$  its length which equals eye; tail long (broken), slender, without folds, spine well developed; pectorals form disk length  $1\frac{4}{5}$  its width, which slightly behind front edge of abdominal region, front and hind borders gently undulous, outer angle obtusely pointed and bent conspicuously backward; outer ventral border feebly rounded, base  $1\frac{7}{10}$  its length.

Upper surface and tail behind spine purple, pectoral fins shading outwards to olive brown. Lower surfaces cream color. Disk length, 152 mm., width, 280 mm. (Ogilby.)

Queensland.

**HOLORHINUS AUSTRALIS (Macleay)**

*Myliobatis australis* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 380, 1881 (type locality: Port Jackson).—McCoy, Prodromus Zool. Victoria, pl. 63, 1882.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 22, 1888 (Port Jackson and Parramatta River).—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (reference).—WAITE, Mem. Australian Mus., vol. 4, p. 47, 1899 (New South Wales); Mem. New South Wales Nat. Club, No. 2, p. 1, 1904.—STEAD, Fishes of Australia, p. 233, 1908.—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 13, pl. 3, fig. 41a, 1927.

*Aetobatus australis* McCULLOCH, Zool. Res. Endeavour, vol. 1, p. 15, 1911 (Shoalhaven Bight, New South Wales, in 15–45 fathoms); Biol. Res. Endeavour, vol. 2, pt. 3, p. 86, fig. 3, 1914 (dentition) (New South Wales).

*Myliobatis aquila* (not Linnaeus) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 489, 1870 (Sydney).—CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 225, 1872 (Hobson's Bay).—HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes of New Zealand), p. 86, 1872 (on Banks).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 380, 1881 (Port Jackson; on Günther).

*Myliobatis nienhofii* (not Schneider) CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 226, 1872 (Melbourne market).

*Myliobatis nienhofii* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 316, 1880 (Port Phillip, on Castelnau); vol. 6, p. 380, 1881 (error).

*Myliobatis tenuicaudatus* (not Hector) GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 433, 1913 (Australia; not New Zealand).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference; part).

Depth 5 to  $5\frac{1}{3}$  in disk length measured to hind pectoral edge; head  $3\frac{2}{5}$  to  $3\frac{3}{5}$ ; disk length  $1\frac{3}{5}$  to  $1\frac{3}{4}$  in its width, disk length

$1\frac{1}{5}$  to  $1\frac{1}{4}$  in tail. Snout  $1\frac{2}{3}$  to  $1\frac{1}{2}$  in head; rostral fins forming broadly convex lobe in front; eye  $3\frac{7}{8}$  to 5,  $2\frac{3}{4}$  to  $2\frac{7}{8}$  in snout,  $3\frac{3}{4}$  to 4 in interorbital; dentary width  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in head; teeth with broad median row 2 to 6 times wide as long, with 2 lateral rows each side; upper lip with narrowly fringed edge, lower pleated; nostrils simple, deep pits, internarial width  $1\frac{1}{5}$  in dentary width; interorbital 1 to  $1\frac{2}{5}$  in head, level, with wide median depression due to broad fontanel. Gill openings equidistant, last shortest. Spiracle deep lateral slit, twice eye, opens laterally.

Skin smooth. Caudal spine  $1\frac{1}{2}$  in interorbital.

Dorsal length  $3\frac{1}{2}$  in head; no anal; tail long, slender, whiplike; pectorals wide, triangular, front edge nearly straight, hind edge slightly concave, ends in rather obtuse front point and acute hind point; ventrals short, broad, hind edge broadly convex; claspers short, flat, somewhat pointed.

Rather dark brown above. Under surface whitish. Tail and dorsal all dusky, at least terminally.

Queensland, New South Wales, Victoria. According to McCulloch attains a width of 1,220 mm.

U.S.N.M. No. 59887. Port Jackson. D. G. Stead. Length, 445 mm.

U.S.N.M. No. 59888. Wouboyn? River, New South Wales. D. G. Stead. Length, 498 mm.

#### HOLORHINUS TENUICAUDATUS (Hector)

*Myliobatis tenuicaudatus* HECTOR, Trans. New Zealand Inst., vol. 9, p. 468, pl. 10, 1877 (type locality: Wellington Harbor, New Zealand).—WAITE, Rec. Canterbury Mus., vol. 1, No. 1, p. 9, 1907 (reference); vol. 1, No. 2, p. 152, 1909 (off Poverty Bay and Bay of Plenty, in 16 to 57 fathoms).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 433, 1913 (New Zealand; not Australia).—WAITE, Rec. South Australian Mus., vol. 2, p. 34, fig. 48, 1921.—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference; part). *Myliobatis aquila* (not Linnaeus) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 489, 1870 (part).

Head to hind spiracle edge 6 in total length. Snout  $1\frac{4}{5}$  in head to hind spiracle edge, as seen from above front profile broadly convex; eye 5, 3 in snout,  $3\frac{1}{2}$  in interorbital; teeth in pavementlike plates, upper flat, lower curved, all yellow; both plates in 2 series, median broad row and 2 laterals, latter of rows of subcircular plates, 3 in width and together about half width of median series, not extending to front of mouth; upper median plates 11, lower 7; nostrils close together, separated by thick columnar frenum; nasal fold long and rectangular, hinder border concave and papillose, widest at free edge where twice its length; interorbital  $1\frac{2}{5}$  in head. Spiracle twice eye diameter.

Body smooth.

Dorsal small, base  $\frac{1}{6}$  less than spiracle, on tail with middle over hinder ventral edge; 2 serrated spines on tail behind fin; tail little

shorter than disk; pectorals form broad disk, length  $1\frac{3}{5}$  its width, front edges little undulate, hind edges concave, outer angles triangular.

Yellowish olive above, with blue transverse bars on head and across disk. Tail black. Lower surfaces white. Total length, 775 mm. (Waite.)

New Zealand.

**HOLORHINUS TOBIJEI (Bleeker)**

*Myliobatis tobijei* BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 26, p. 130, 1857 (type locality: Nagasaki); Nederland. Tijdschr. Dierk., vol. 4, p. 115, 1874 (Chinese drawing).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Yokohama).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 43, 1901 (Nagasaki; Yokohama).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 663, 1903 (Tokyo, Hakodate, Onomichi, Hiroshima, Hakata, Nagasaki).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 433, 1913 (Japan).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, No. 3, p. 3, 1928 (Fusan and Mokpo, Korea).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (Japan).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 15, 1931 (Nagasaki).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 172, pl. 3, fig. 10 (teeth), 1932 (Tsingtao).—FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 277, fig. 27, 1932 (Chefoo).—TANAKA, Jap. Fish. Life Colours, No. 35, 1933.—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 113, 1933 (Ningpo).

*Actobatis tobijei* SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 489, 1912 (Naha, Okinawa).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Rikuzen).—TARANETZ, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 52, 1937.

*Myliobates aquila* (not Linnaeus) SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 310, pl. 142, 1850 (Japan).

*Myliobatis aquila* BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Japan).—GÜNTHER, Rep. Voy. Challenger, vol. 1, pt. 4, p. 63, 1880 (Yokohama).—PIETSCHMANN, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 117, pt. 1, p. 638, 1908 (Japan).

*Myliobatis cornuta* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 490, 1870 (type locality: Japan).—ISHIKAWA and MATSUURA, Prelim. Cat. Fish. Mus. Tokyo, p. 60, 1897.

*Myliobatis cornutus* JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 43, 1901 ("Japan").

Depth  $5\frac{1}{2}$  to  $5\frac{3}{4}$  in disk length as measured to hind pectoral edge; head 3 to  $3\frac{1}{5}$ ; disk length  $1\frac{4}{5}$  to 2 in its width, 2 in tail. Snout  $1\frac{3}{4}$  to  $1\frac{4}{5}$  in head; eye 6 to  $7\frac{1}{2}$ ,  $3\frac{1}{4}$  to  $4\frac{3}{4}$  in snout,  $5\frac{1}{4}$  to  $5\frac{1}{2}$  in interorbital; dentary width  $2\frac{1}{3}$  to  $2\frac{3}{5}$  in head; teeth with broad median row 4 to 6 times wide as deep and 3 rows of small teeth each side; upper lip with fringed edge, lower with pleats; nostrils each simple deep pit, internarial width  $1\frac{1}{3}$  in dentary width; interorbital  $1\frac{1}{5}$  to  $1\frac{1}{4}$  in head, level, with wide median depression due to broad fontanel. Gill openings equidistant, last shortest. Spiracle twice eye, large, deep, open laterally.

Skin smooth. Caudal spine long as head.

Dorsal length 3 in head; no anal; tail long, slender, whiplike; pectorals broad, front edge entire, hind edge little concave, angles rather obtuse; ventrals broad, obtuse, rather short; claspers flattened, conic, ends blunt, each with 2 deep lateral grooves, length  $1\frac{1}{2}$  in head.

Back uniform brown, little paler about edges of disk. Tail dusky. Under surface of body whitish.

China, Japan, Korea. None of my specimens show any lighter or paler spots.

U.S.N.M. No. 8067. Nippon. William Stimpson. Length, 575 mm.

U.S.N.M. No. 22611. Miuramisaki, Japan. Imperial Government of Japan. Length, 565 mm.

U.S.N.M. No. 49409. Yokohama, Japan. Albatross collection. Length, 565 mm.

U.S.N.M. No. 51297. Nagasaki, Japan. Albatross collection. Length, 260 mm. to end of cut off tail.

U.S.N.M. No. 75866. Japan ? P. L. Jouy. Length, 585 mm.

U.S.N.M. No. 75867. Japan ? P. L. Jouy. Length, 550 mm.

U.S.N.M. No. 75868. Japan ? P. L. Jouy Length, 485 mm.

#### Genus AETOMYLU<sup>S</sup> Garman

*Aetomylus* GARMAN, Bull. Mus. Comp. Zool., vol. 51, p. 252, 1908. (Type, *Myliobatis maculatus* Gray, orthotypic.)

*Aetomyleus* SHARP, Zool. Record, No. 44, 1908, index, p. 1, 1910. (Type, *Myliobatis maculatus* Gray.)

*Aetomylaeus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 434, 1913. (Type, *Myliobatis maculatus* Gray.)

Disk broad. Tail without caudal spine. Head moderately conspicuous. Teeth with 3 narrow lateral rows each side of wide median row. Rostral fins not continuous with pectorals at side of head, placed on lower level and united in one lobe.

#### ANALYSIS OF SPECIES

*a*<sup>1</sup>. Dorsal origin behind ends of ventral bases.

*b*<sup>1</sup>. Back with median small spines and tubercles; brown-edged ocelli on hind part of disk \_\_\_\_\_ *maculatus*

*b*<sup>2</sup>. Back smooth; brownish with network of black, anteriorly in bands. \_\_\_\_\_ *vespertilio*

*a*<sup>2</sup>. Dorsal origin opposite ends of ventral bases.

*c*<sup>1</sup>. Disk less twice wide as long; green brown-edged ocelli on hind part of disk \_\_\_\_\_ *milvus*

*c*<sup>2</sup>. Disk twice wide as long; about 5 blue cross bands, disappearing with age. \_\_\_\_\_ *nichofii*

#### AETOMYLU<sup>S</sup> MACULATUS (Gray)

*Myliobatis maculatus* GRAY, Illustr. Indian Zool., Hardwicke, vol. 2, pl. 101, 1832-34 (type locality: Pinang).—MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 178, 1841 (India).—GRAY, List fish British Museum, p. 129, 1851 (no locality).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 84, 1852 (Batavia, Samarang, Pasuruan); (Bengal), vol. 25, p. 82, 1853 (reference); Act. Soc. Sci. Indo-Néerl., vol. 5, no. 7, p. 2, 1859 (Sinka-

wang, Borneo); Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 639, 1865 (copied).—BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 490, 1870 (India).—DAY, Fishes of India, pt. 4, p. 742, 1878; Fauna British India, Fishes, vol. 1, p. 59, 1889.—FOWLER, List Fish. Malaya, p. 19, 1938 (reference).

*Myliobates maculatus* RICHARDSON, Ichth. China Japan, p. 198, 1846 (China Sea).

*Myliobatis maculata* ANNANDALE, Mem. Indian Mus., vol. 2, p. 53, 1909 (off Orissa).

*Myliobatis maculata* MALPAS, Ceylon Administr. Rep., 1921, p. E8 (error).

*Aetomylacis maculatus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 435, 1913 (Indian Seas, East Indies, Pinang).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 90, fig. 7, 1935 (Bangkok).—SUWATTI, Index Fish. Siam, p. 7, 1937 (Maenam Thai-ein; Sriracha).

*Aetomylus maculatus* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference); Hong Kong Nat., vol. 1, p. 183, fig. 22, 1930 (compiled).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 113, fig. 11, 1933 (Yenting).

*Myliobatis cyclurus* VAN HASSELT, Algemeen Konst. Letterbode, p. —, 1823 (type locality: Java); Bull. Sci. Nat. Féruccac, vol. 2, p. 90, 1824 (Java).

Head to first gill opening 3 in disk length, 13 in tail. Snout 2 in head to first gill opening; eye  $6\frac{1}{4}$ , 3 in snout, 4 in interorbital, pupil erect; mouth width  $2\frac{3}{4}$  in head to first gill opening; teeth in median row 5 to 6 times wide as long; internarial  $3\frac{1}{3}$  in head to first gill opening; interorbital  $1\frac{1}{2}$ , concave in front of fontanel. Spiracles large, hardly visible from above,  $2\frac{1}{4}$  times long as eye.

Skin rough with small tubercles or spines in dorsal area on young.

Dorsal length about half interorbital, rounded above, hind edge nearly vertical, short free edge behind base ends in right angle, inserted little behind ends of ventral bases; tail over 4 times disk length, without spine; pectorals form broad disk with length  $1\frac{2}{3}$  its width, outer ends curved, acute, front edge convex, hind edge concave; ventrals longer than broad, inner edge short, hind edge oblique, angles rounded.

Back brown with dark edged rounded spots of whitish posteriorly. Tail indistinctly banded brown and darker. White below. Length, 724 mm. (Garman.)

India, Pinang, Singapore, East Indies, China Sea.

#### AETOMYLUS VESPERTILIO (Bleeker)

*Myliobatis vespertilio* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 85, 1852 (type locality: Batavia).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 636, 1865 (copied).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 490, 1870 (copied).—FOWLER, List Fish. Malaya, p. 20, 1938 (reference).

*Aetomylacis vespertilio* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 437, 1913 (Batavia and Pinang).—SUWATTI, Index Fish. Siam, p. 7, 1937 (Siam).

*Aetomylus vespertilio* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference).

*Myliobatis milvus* (not Müller and Henle) CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1415, 1849 (part; not synonymy).

Head truncate; snout 6 in greatest disk width; eye  $3\frac{1}{2}$  in interorbital, pupil cordiform; median row of teeth 6 times broad as long, lower longer than wide; nasal valves confluent, flap with rounded angles, little notched in middle; oral papillae 6.

Skin smooth. No horn on orbit.

Tail long, without spine; dorsal origin behind ends of ventral bases, fin not extending to ends of ventrals; pectorals form disk nearly twice broad as long, disk length  $5\frac{4}{5}$  in tail, acute, front edges convex, hind edges concave; hind pectoral angles above ventrals.

Fawn color, with anastomosing black lines arranged transversely on front half of disk so interspaces resemble broad transverse bands; elsewhere lines form open network; front pectoral and dorsal edges without black meshes. Tail brownish near base, with faint blackish rings, otherwise black. Ventral surfaces white. Disk to vent 193 mm., tail, 1,165 mm. (BLEEKER; GARMAN.)

Pinang, Java. Bleeker had a single female 560 mm.

#### AETOMYLUS MILVUS (Müller and Henle)

*Myliobatis milvus* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 178, 1841 (type locality: Red Sea).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1415, 1849 (Pinang).—GRAY, List fish Brit. Mus., p. 129, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 87, 1852 (Batavia and Samarang).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 638, 1865 (Sea of the Indies).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 491, 1870 (China, East Indies).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 686, 1871 (Red Sea).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Batjan).—ELERA, Cat. Fauna Filip., vol. 1, p. 621, 1895 (Manila).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 589, 1912 (Batavia).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 624, 1926 (Sarawak).

*Aetomyleus milvus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 435, 1913 (Red Sea, China, East Indies).—FOWLER, Journ. Bombay Nat. Hist. Soc. vol. 33, No. 1, p. 103, 1928 (Bombay).

*Aetomylus milvus* FOWLER, 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (Indian Ocean); Hong Kong Nat., vol. 1, No. 4, p. 184, 1930 (Indian Ocean).

*Aetomylaeus milvus* SUVATTI, Index Fish. Siam, p. 7, 1937 (Menam?).

*Myliobatis vultur* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 179, 1841 (type locality: China).—GRAY, List fish British Museum, p. 129, 1851 (China).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 640, 1865 (compiled).

*Myliobates vultur* RICHARDSON, Ichth. China Japan, p. 198, 1846 (Chinese Seas).

*Myliobates oculatus* RICHARDSON, Ichth. China Japan, p. 198, 1846 (type locality: Sea of China, Canton).

*Myliobatis oculatus* GRAY, List fish British Museum, p. 129, 1851 (reference).

Skull wide, broadly convex in front; snout about twice long as nasal valves, rounded anteriorly; eye rather small,  $5\frac{1}{2}$  in interorbital; mouth width  $2\frac{1}{2}$  in interorbital; median teeth 7 or 8 times wide as

long and 3 series of small laterals each side; internarial  $1\frac{1}{8}$  in pre-oral length, nasal valves form broad free flap, leaving wide space before teeth, hind edge shortly fringed and with slightly median notch; interorbital level, fontanel moderate. Spiracle little larger than eye.

Body entirely smooth.

Dorsal origin above ends of ventral bases, hind margin not free from tail, edge  $1\frac{1}{3}$  in interorbital; tail without spine; disk length  $1\frac{1}{2}$  in its width, convex along front edges, hind edges concave and outer angles rather narrow; ventrals little more than interorbital, width little less half length; claspers extend but little beyond ventrals.

Back dark uniform brown, without traces of spots. Below whitish, with disk marginally more or less soiled with dirty brown. Iris dark gray. Tail brown, paler below anteriorly.

Red Sea, India, Pinang, East Indies, Philippines, China.

1 example. A.N.S.P. Bombay, India. Prof. F. Hallberg. Disk length to clasper ends, 280 mm., tail, 328 mm., disk width, 438 mm.

#### AETOMYLOUS NICHOFII (Schneider)

*Raja nichofii* SCHNEIDER, Syst. Ichth. Bloch, p. 364, 1801 (on *Zee-rleermuis* Nieuhof, Gadenk. Reiz., vol. 1, p. 278, fig., 1682, type locality: East Indies).

*Aetobatus nichofii* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 112, 1816 (name only).

*Myliobatis nieuhovii* CUVIER, Règne animal, vol. 1, p. 138, 1817 (on Willoughby).

*Myliobatis nieuhofii* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 177,

1841 (India, New Holland, Mediterranean, Malabar, Pondicherry).—

CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1414, 1849 (Pinang).—GRAY,

List Fish British Museum, p. 1929, 1851 (reference).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—BLEEKER, Verh. Batav. Genootsch.

(Plagiost.), vol. 24, p. 85, 1852 (Batavia); (Bengal), vol. 25, p. 9, 1853 (on *Mookarah tenkee* Russell, Fishes of Coromandel, vol. 1, p. 4, pl. 7,

Vizagapatam), p. 82 (reference), 1803; Nat. Tijdschr. Nederland. Indië, vol. 10, p. 348, 1856 (Rio, Bintang); vol. 16, p. 196, 1858 (Sinkawang, Borneo); Act. Soc. Sci. Indo-Néerl., vol. 5, No. 7, p. 2, 1859 (Sinkawang).—

DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 638, 1865 (Pondicherry).—KNER,

Reise Novara, Fische, p. 421, 1865 (Java).—BLEEKER, Versl. Meded. Akad.

Wet. Amsterdam, ser. 2, vol. 2, p. 290, 1868 (Rio, Bintang).—GÜNTHER,

Cat. Fishes British Mus., vol. 8, p. 491, 1870 (Pinang, Moluccas, Japan).—

CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 227, 1872 (Mel-

bourne materials; Singapore; Malacca); vol. 2, p. 58, 1873 (Melbourne sea).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 410, 1876 (Singa-

pore).—DAY, Fishes of India, pt. 4, p. 742, 1878 (Madras).—KÁROLI,

Termesz. Füzetek, Budapest, vol. 5, p. 148, 1881 (Yokohama).—LUCAS,

Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 46, 1890 (passim).—ELERA,

Cat. Fauna Filip., vol. 1, p. 621, 1895 (Cavite, Luzon).—JORDAN and

FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 604, 1903 (on Günther's Japanese record).—VOLZ, Nat. Tijds. Nederland. Indië, vol. 66, p. 241, 1907

(Padang).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 51, 1909 (off Orissa, Chittagong, Burma, Ganges mouth).—BEAN and WEED, Proc. U. S. Nat.

Mus., vol. 42, p. 588, 1912 (Batavia).—PEARSON, Ceylon Administr. Rep., 1915–18, pp. F10–F14.—MALPAS, Ceylon Administr. Rep., 1921, p. E8.—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, p. 79, 1929 (Cochin China).

*Myliobatis nicuhofii* RICHARDSON, Ichth. China Japan, p. 198, 1846 (Chinese and Australian Seas).

*Myliobatis nicuhofii* BLEEKER, Versl. Meded. Akad. Wet. Amsterdam, vol. 12, p. 30, 1861 (Singapore).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 43, 1901 (Japan).

*Myliobatis nicuhofii* SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E42, E49, E50.—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 353, 1929 (Travancore).

*Myliobatis nichofii* FOWLER, List Fish. Malaya, p. 19, 1938 (reference).

*Actomylaeus nichofii* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 436, 1913 (India, East Indies, Japan).

*Actomylylus nichofii* FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 506, 1930 (reference); Hong Kong Nat., vol. 1, p. 184, 1930 (compiled).

*Actomylycus nichofii* CHEVEY, Inst. Océanogr. Indochine, 19<sup>e</sup> note, p. 7, 1932 (Indo-China).

*Raja fasciata* SHAW, General zoology, vol. 2, p. 286, pl. 143, 1804 (on Willoughby; on *Mookarah tenkee* Russell).

*Raia macrocephala* (Parkinson) RICHARDSON, Ichth. China Japan, p. 198, 1846 (name in synonymy).

Depth 5½ in disk length as measured to hind pectoral edge; head 3⅓ to 3½; disk length 1⅔ to 1⅔ in its width, 2½ to 4⅓ in tail. Snout 1¾ to 2 in head, forms pointed lobe at low level in front; eye 7 to 7½, 3½ to 4 in snout, 4½ to 7 in interorbital; dentary width 2¾ to 3 in head; teeth with broad median row and 3 narrow lateral rows each side; upper lip very finely and inconspicuously fringed, lower entire; nostril each simple deep pit, rather larger internarial little less than mouth width; interorbital 1⅔ to 1½ in head, broad, nearly level with slight depression at fontanel. Gill openings small, subequal, last smallest. Spiracles large, deep, twice eye, shielded above to open laterally.

Skin smooth in young, very finely though imperfectly asperous over much of disk above with age. No caudal spine.

Dorsal triangular, front edge 2⅓ to 3½ in head; no anal; tail long, slender, whiplike; pectoral little broader than long, its front edge nearly straight, hind edge slightly concave, outer and hind angle both narrowly pointed; ventrals long, rather slender, ends convex; claspers ¾ front ventral edge, conic, extend well beyond fin.

Back dark brown anteriorly with 3 to 5 transverse or horizontal gray bands, posteriorly large, rather close set, variable, rounded grayish blotches. Tail of young rather irregularly blotched dusky or dark brown on whitish ground color. Under surface of body whitish, with age hind margins of pectorals rather narrowly dusky.

India, Ceylon, Burma, Pinang, Singapore, East Indies, Philippines, Cochin China, China, Japan, Australia, Victoria. Of the three speci-

mens reported from Java by Bean and Weed I have examined the two listed below. I do not find that their *Myliobatis milvus*, identified as the larger specimen, is different. The smaller, though with more or less apparent uniform disk, shows traces of a few of the gray horizontal lines anteriorly as well as the posterior spots.

U.S.N.M. No. 72483. Batavia, Java. Bryant and Palmer. Length, 840 mm.

U.S.N.M. No. 72484. Batavia, Java. Bryant and Palmer. Length, 1,540 mm.

### Genus MYLIOBATIS Geoffroy Saint-Hilaire

*Myliobatis* GEOFFROY SAINT-HILAIRE, Descript. Egypte, Poiss., vol. 1, pl. 26, 1809.

(Type, *Myliobatis bovina* Geoffroy Saint-Hilaire, designated by Fowler, Geol. Surv. New Jersey Bull. 4, p. 84, 1911.)

*Pteromylaeus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 437, 1913. (Type, *Myliobatis asperrimus* Jordan and Evermann.)

Head rather long. Tail long, slender, with serrated spine behind dorsal. Snout somewhat narrowed forward. Teeth tessellate, in 7 rows as very wide median row and each side with 3 very narrow rows. Spiracles open upward. Pectorals falciform, not continuous with rostral fins at each side of head. Ventrals elongate, narrow.

Panama, Eastern Atlantic, Mediterranean, South Africa, Admiralty Islands.

#### ANALYSIS OF SPECIES

- |   |                  |
|---|------------------|
| <i>a<sup>1</sup></i> . Dorsal origin above ends of ventral bases; uniform brown, young with 7 or 8 pale transverse streaks----- | <i>bovina</i>    |
| <i>a<sup>2</sup></i> . Dorsal origin near ends of pectoral bases; greenish gray with irregular whitish spots-----               | <i>punctatus</i> |

#### MYLIOBATIS BOVINA Geoffroy Saint-Hilaire

*Myliobatis bovina* GEOFFROY SAINT-HILAIRE, Descr. Egypte, Poiss., vol. 1, pl. 26, fig. 1, 1809; p. 323, 1827 (type locality: Egypt).—GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 490, 1870 (Madeira).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 475 (Bonaparte material).

*Pteromylaeus bovina* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 439, 1913 (Mediterranean and neighboring Atlantic).

*Pteromylaeus bovinus* BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 83, 1925 (Agulhas Bank).

*Myliobatis aquila* (not Linnaeus) BONAPARTE, Icon. Fauna Ital., Pesci., pt. 2, fasc. 2, deser., pl., fig., 1833 (Italy).

*Myliobates episcopus* VALENCIENNES, Hist. Nat. Canaries, vol. 2, pt. 2, p. 98, pl. 24, 1836–44 (type locality: Canary Islands; Algiers).

*Myliobatis bonaparti* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 635, 1865 (type locality: Mediterranean; Algeria; types of *Myliobates episcopus*).

Head large. Snout 1 1/2 in head, extended, slender, tip blunt; mouth width 3 in head; teeth in 7 rows, median 6 to 8 times wider than long, outer narrow; internasal 4 2/3 in head, front nasal valves confluent; preoral length 1 3/4. Spiracle large, scarcely visible as viewed above.

Dorsals small, inserted close behind ends of dorsal bases, length  $2\frac{3}{4}$  in head; tail 3 times disk length, with serrated spine; pectorals form broad disk, about twice wide as long; ventrals rather long or front edge  $1\frac{3}{4}$  in head.

Brown above. White below.

Eastern Atlantic, Mediterranean, South Africa. The young with 7 or 8 obsolete or pale transverse whitish streaks.

1 example. A.N.S.P. Italy. C. L. Bonaparte. No. 216. Female. Length, 889 mm.

**MYLIOBATIS PUNCTATUS Maclay and Macleay**

*Myliobatis punctatus* MACLAY and MACLEAY, Proc. Linn. Soc. New South Wales, vol. 10, pt. 4, p. 675, 1885 (type locality: Admiralty and Lub or Hermit Islands).

*Miliobatis punctatus* MACLAY and MACLEAY, *op. cit.*, pl. 46, figs. 1, 2, 1885.

*Aetobatis punctata* GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 497, 1910 (copied).

*Pteromylaeus punctatus* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 439, 1913 (copied).—FOWLER, Mem. Bishop Mus., vol. 10, p. 25, 1928 (compiled); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).

Head to first gill opening  $3\frac{9}{10}$  in total length. Snout  $2\frac{1}{4}$  in head, long and triangularly pointed; eye about 20, 9 in snout,  $7\frac{1}{2}$  in interorbital, pupil vertically oval; mouth width  $4\frac{3}{4}$  in head or  $2\frac{1}{2}$  in preoral length; 2 curtainlike flaps overlap lateral labial folds, which distinct on open mouth and lower border of labial flaps slightly notched; upper dental plates nearly twice wide as lower, formed of many longitudinal rows of teeth with median largest; on back of mouth above 7 papillae in first row, 4 in second, smaller lateral lower papillae; internarial  $2\frac{4}{5}$  in preoral length, nostrils subequal with eyes; interorbital  $2\frac{1}{3}$  in head, convex. Gill openings subequal, interspace of last pair  $1\frac{7}{8}$  in that of first pair. Spiracle about 3 times eye and as far posterior.

Dorsal slightly greater than space between spiracles, hind pectoral edge opposite center in its length or about middle of ventral length, rounded behind; tail  $1\frac{1}{3}$  in disk length, with 2 spines inserted about first fourth its length; pectorals form wide disk, length  $1\frac{1}{2}$  its width, front edges slightly convex, hind edges concave and outer angles triangular; ventrals obtuse, width  $1\frac{4}{5}$  length.

Above greenish gray, with variable irregular white spots. Below dirty white, darker on pectorals. Disk length to hind ventral edge, 1,130 mm., tail from dorsal fin, 640 mm. (Maclay and Macleay.)

Melanesia.

**Genus AETOBATUS Blainville**

*Aetobatus* BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 122, 1816. (Type, *Raja narinari* Euphrasen, designated by Gill, Proc. U. S. Nat. Mus., vol. 17, p. 122, 1894.)

*Aetobatis* BLAINVILLE, Faune Française, Poissons, p. 38, 1825. (Type, *Raja narinari* Euphrasen.)

*Aetobates* RICHARDSON, Ichth. China Japan, p. 198, 1846. (Type, *Raja narinari* Euphrasen.)

*Aetobatys* DUMÉRIL, Mem. Acad. Sci. France, vol. 27, p. 145, 1856. (Type, *Raja narinari* Euphrasen.)

*Stoasodon* CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1416, 1849. (Type, *Raja narinari* Euphrasen, monotypic.)

*Goniobatis* AGASSIZ, Proc. Boston Soc. Nat. Hist., vol. 6, p. 385, 1859. (Type, *Raja flagellum* Schneider, monotypic.)

Tail long, slender, with serrated basal spine. Head prominent, narrowing downward and forward on sides. Snout narrower, produced. Teeth in single row in each jaw, fused, lower pavement produced. Front nasal valves confluent; median notch in pectoral flap. Dorsal fin on tail basally before serrated spine. Pectorals slightly falciform, not continuous forward to snout. Rostral fins separated from pectorals and at lower level on side of head. Ventrals narrow, elongate.

#### ANALYSIS OF SPECIES

a<sup>1</sup>. Snout long, tapering, acute; uniform or spotted with whitish-----*narinari*

a<sup>2</sup>. Snout short, tapering, blunt; marked with thickly set small dark bordered spots-----*ocellatus*

#### AETOBATUS NARINARI (Euphrasen)

*Raja narinari* EUPHRASEN, Kon. Vet. Acad. Nya Handl. Stockholm, vol. 11, p. 217, pl. 10, 1790 (type locality: St. Bartholomieu, West Indies) (on *Narinari brasiliensis* Maregrave, Hist. Nat. Brasil., p. 175, fig., 1648, Brazil).

*Raja narinari* SCHNEIDER, Syst. Ichth. Bloch, p. 361, 1801 (Tahiti).

*Myliobatis narinari* BENNETT, Life of Raffles, p. 694, 1830 (Sumatra).

*Aetobatis narinari* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 179, 1841 (India, Red Sea; Brazil; Surinam).—BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal).—GRAY, List fish British Museum, p. 130, 1851 (Sumatra).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 87, 1852 (Batavia, Samarang, Surabaja, Kammal); (Bengal), vol. 25, p. 9 (on *Eel tenkee* Russell), p. 82, 1853 (reference); Nat. Tijdschr. Nederland. Indië, vol. 11, p. 95, 1856 (Banda); Act. Soc. Sci. Ind.-Néerl., vol. 1, No. 3, p. 10, 1856 (Macassar).—GUICHENOT, Notes île Réunion, vol. 2, p. 32, 1863.—BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 240, 1863 (Obi Island).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 641, 1865 (Brazil, Red Sea, India).—DAY, Fishes of Malabar, p. 280, 1865.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 492, 1870 (Pinang, India, Seychelles, Sumatra).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 686, 1871 (Red Sea).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 41, 1874 (Bowen, South Sea).—PETERS, Monatsb. Akad. Wiss. Berlin, 1875, p. 447, 1876 (Mauritius, Seychelles).—DAY, Fishes of India, pt. 4, p. 743, pl. 194, fig. 4, 1878.—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 64, 1879 (South Seas).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, pt. 2, p. 317, 1880 (Cape York); vol. 6, p. 381, 1881 (Cape York).—OGILBY, Proc. Linn. Soc. New South Wales, vol. 10, p. 466, 1885 (Cape Hawke, New South Wales); Cat. Fish. Australian Mus., pt. 1, p. 22, 1888 (Cape Hawke; Madras).—DAY, Fauna British India, Fishes, vol. 1, p. 59, fig. 24, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 244 (Muscat).—BARTLETT, Sarawak Gazette, vol. 26,

No. 366, p. 134, 1896 (Buntal and Santubong).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 199, 1904 (locality ?).—VOLZ, Nat. Tijdschr. Nederland. Indië, vol. 66, p. 241, 1907 (Sumatra ?).—LLOYD, Rec. Indian Mus., vol. 1, p. 220, 1907 (Akyab).—STEAD, Fishes of Australia, p. 223, 1908.—ANNANDALE, Mem. Indian Mus. vol. 3, p. 4, 1910 (off Madras coast).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 496, 1910 (Hawaiian Islands; Samoa; Solomons).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 11, p. 56, 1911 (Natal).—PEARSON, Ceylon Administr. Rep. 1912–13, p. E5.—SOUTHWELL, Ceylon Administr. Rep., 1912–13, pp. E41, E44, E48, E50.—WEBER, *Siboga Exped.*, Fische, vol. 57, p. 604, 1913 (Lombok).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 9, 1913 (Meckran; Oman).—BAMBER, Journ. Linn. Soc. London, vol. 31, Zool., p. 478, 1915 (Sudanese Red Sea).—PEARSON, Ceylon Administr. Rep., 1915–18, pp. F10, F13, F14.—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 3, p. 289, 1916 (synonymy).—MALPAS, Ceylon Administr. Rep., 1921, p. E5.—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 83, pl. 5, fig. 1, 1925.—McCULLOCH, Fishes of New South Wales, ed. 2, p. 13, pl. 3, fig. 42a, 1927.—PILLAY, Journ. Bombay Soc. Nat. Hist., vol. 33, p. 353, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, p. 79 (Mekong, Saigon River), p. 175, 1929 (Cochin China).

*Aetobatis narrinari* STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 70, p. 519, 1901 (Laysan).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).

*Aetobates narrinari* SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.

*Aetobatus narrinari* SEALE, Occ. Pap. Bishop Mus., vol. 1, No. 5, pp. 20, 22, 1902 (Honolulu).—JENKINS, Bull. U. S. Fish Comm., vol. 22 (1902), p. 421, 1904 (Honolulu).—SNYDER, Bull. U. S. Fish Comm., vol. 22, 1902, p. 515, 1904 (Honolulu).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 475, (no data).—GUDGER, Carnegie Inst. Washington, Publ. No. 183, p. 241, pls. 1–10, 1914 (historical).—OGILBY, Commerc. Fish. Fisher. Queensland, p. 46, 1915 (Moreton Bay); Mem. Queensland Mus., vol. 5, p. 89, 1916 (Moreton and Wide Bays).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1925, p. 194 (Durban Bay, Natal).—FOWLER and BALL, Bishop Mus., Bull. 26, p. 5, 1925 (Johnston Island).—JORDAN, EVERMANN, TANAKA, Proc. California Acad. Sci., ser. 4, vol. 16, p. 651, 1927 (Honolulu).—FOWLER, Mem. Bishop Mus., vol. 10, p. 26, 1928 (Honolulu and Johnston Island).—McCULLOCH, Austral. Mus. Mem., No. 5, pt. 1, p. 30, 1929 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (Tropical Atlantic); Hong Kong Nat., vol. 1, p. 186, 1930 (Indian Ocean, Hawaii, Atlantic); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (reference).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 15, 1931 (Kagoshima).—CHEVEY, Inst. Oceanogr. Indochine, 19<sup>e</sup> note, p. 7, 1932 (Cochinchina).—WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 9, p. 115, fig. 12, 1933 (Yenting).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Taytay Bay, Palawan; Sulu Islands).—TORTONESE, Boll. Mus. Zool. Anat Comp. Torino, ser. 3, vol. 45, No. 63, p. 12, 1935–36 (Mar Rosso).—HERRE, Field. Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 24, 1936 (Tahiti; New Hebrides; Solomons; Dutch New Guinea; Celebes; Borneo; Philippines).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 137, fig. 57, 1936 (tropical Atlantic and eastern Pacific).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 17, 1937 (reference).—SUVTATTI, Index Fish. Siam, p. 7, 1937 (Gulf of Siam).—FOWLER, List Fish. Malaya, p. 19, 1938 (reference).

*Stoasodon marinari* CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1416, 1849 (Pinang, Malay Peninsula, Singapore).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903), p. 49, fig. 7, 1905 (Honolulu; Hilo).—JORDAN and SEALY, Bull. Bur. Fisher., vol. 26 (1906), p. 4, 1907 (Cavite).—JORDAN, Journ. Pan Pacific Inst., vol. 2, No. 4, p. 3, 1927 (Samoa).

*Raia flagellum* SCHNEIDER, Syst. Ichth. Bloch, p. 361, pl. 75, 1801 (type locality: Coromandel).

*Actobatis flagellum* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 180, 1841 (India, Red Sea).—GRAY, List fish British Museum, p. 130, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 82, 1852 (Indian Ocean, Red Sea, China); (Bengal), vol. 25, p. 82, 1853 (reference).—BLYTH, Journ. Asiatic Soc. Bengal, vol. 29, p. 37, 1860 (Calcutta).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 642, 1865 (Sea of the Indies).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 246 (note), 1871 (Red Sea).—ANNANDALE, Mem. Indian Mus., vol. 2, p. 57, 1909 (off Orissa and mouth Chilka Lake).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 44, 1913 (Red Sea and Indian Ocean).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (Hawaii; Indian Ocean).

*Actobates flagellum* RICHARDSON, Ichth. China Japan, p. 198, 1846 (China Seas, Macao).

*Actobatus flagellum* BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 82, 1852 (China).

*Raja guttata* (not Schneider, 1801) SHAW, General zoology, vol. 5, p. 285, pl. 142, 1804 [type locality: Madagascar; Coromandel; Brazil (on *Eel tenkee* Russell, Fishes of Coromandel, vol. 1, p. 5, pl. 8, 1803, Vizagapatam)].

*Actobatus guttata* ANNANDALE, Mem. Indian Mus., vol. 2, p. 56, pt. 1909.

? *Actobatus sinesis* BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 112, 1816 (name only).

? *Actobatus flicaudatus* BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 112, 1816 (name only).

? *Actobatus forsteri* BLAINVILLE, Bull. Soc. Philom., Paris, vol. 8, p. 112, 1816 (name only).

*Raia quinqueaculeata* QUOY and GAIMARD, Voy. *Uranie*, Zool., p. 200, pl. 43, fig. 3, 1824 (type locality: Guam).

*Myliobatis celenkei* RÜPPELL, Neue Wirbelth., Fische, p. 70, pl. 19, fig. 3, 1835 (teeth) (type locality: Djidda and Massaua).

*Actobatis indica* SWAINSON, Nat. Hist. Animals, vol. 2, p. 321, 1839 (on *Eel tenkee* Russell).

*Myliobatis macroptera* McCLELLAND, Calcutta Journ. Nat. Hist., vol. 1, p. 60, pl. 2, fig. 1, 1841 (type locality: Bengal).

*Raja edentula* (Forster) LICHTENSTEIN, Descr. Anim. Forster, p. 227 (Tahiti), p. 256, 1844 (type locality: Tanna).

*Actobatis latirostris* DUMÉRIL, Arch. Mus. Hist. Nat. Paris, vol. 10, p. 242, pl. 20, fig. 1, 1858 (type locality: Gaboon coast); Hist. Nat. Elasmobr., vol. 1, p. 643, 1865 (type).

*Goniobatis meleagris* AGASSIZ, Proc. Boston Soc. Nat. Hist., vol. 6, p. 385, 1859 (type locality: Hawaiian Islands).

*Actobatis laticeps* GILL, Ann. Lyceum Nat. Hist. New York, vol. 8, 1865, p. 137, 1861 (type locality unknown).

*Actobatis tenuicaudatus* HECTOR, Trans. New Zealand Inst., vol. 9, p. 468, 1877 (type locality: Wellington Harbour).—McCULLOCH, Biol. Res. *Endeavour*, vol. 2, pt. 3, p. 86, text fig. 3, 1914 (dentition).

*Myliobatis tenuicaudatus* HECTOR, Trans. New Zealand Inst., vol. 9, pl. 10, figs. a-e, 1877. (Error.)

*Myliobatis tenuicaudatus* WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 152, pl. 23, 1909 (off Poverty Bay and Bay of Plenty).

*Myliobatis aquila* (not Linnaeus) KENT, Great Barrier Reef, p. 103, 1893 (Elliott Island).

*Dicroidatis cregoodoo* (not Cantor) KENT, Great Barrier Reef, p. 370, 1893 (part).

Depth  $4\frac{1}{5}$  to  $4\frac{3}{4}$  in disk length; head  $2\frac{7}{8}$  to 3; disk length  $1\frac{1}{2}$  to  $1\frac{4}{5}$  in its width, 4 in tail. Snout  $1\frac{7}{8}$  to 2 in head, forms pointed lobe at low level in front; eye 8 to  $10\frac{1}{2}$ ,  $4\frac{1}{4}$  to 5 in snout,  $6\frac{3}{4}$  to  $7\frac{3}{4}$  in interorbital; dentary width  $3\frac{2}{3}$  to 4 in head; teeth uniserial, lower pavement projecting slightly; lips papillose; nostrils each simple deep slit, internarial  $1\frac{1}{4}$  to  $1\frac{1}{2}$  in dentary width; interorbital  $1\frac{1}{2}$  to  $1\frac{4}{5}$  in head, broad, nearly level or only very slightly convex. Gill openings subequal or last smallest, equidistant. Spiracles large, deep, oblique apertures, twice eye diameter.

Skin smooth. Caudal spine (single in my specimens)  $1\frac{2}{3}$  to  $1\frac{7}{8}$  in interorbital.

Dorsal length  $3\frac{3}{4}$  to  $4\frac{1}{8}$  in head; no anal; tail very long, whip-like; pectoral forms very wide disk, front edges slightly convex and hind edges slightly concave, acute at outer angle; ventral  $1\frac{1}{3}$  to  $1\frac{2}{5}$  in head, rather narrow and obtuse or convex terminally.

Back brown or olive brown. Scattered white, creamy or gray-white spots scattered principally over last half of disk, largest toward middle of disk, and become little more numerous and smaller marginally behind. All spots well contrasted, though ill defined or without sharp borders. Few spots may extend on front of back, on ventrals and base of tail, none on head or greater part of tail. Under surface whitish, outer angles of pectorals marginally little brownish.

Red Sea, Arabia, Natal, Madagascar, Seychelles, India, Ceylon, Malay Peninsula, Pinang, Singapore, East Indies, Philippines, Cochin China, China, Queensland, New South Wales, Melanesia, Micronesia, Polynesia, Hawaiian group. A well-marked species known by its uniform or ill-defined white spots chiefly on the posterior portion of the disk. These quite variable and sometimes said to be entirely absent. The white spots are not known to extend on the head. As here understood *Aetobatis narinari* (Euphrasen) also ranges through the tropical Atlantic and along the American shores in the tropical eastern Pacific.

4656. Manila Harbor. June 13, 1908. Length, 1,020 mm.

8292. Sorsogon market. March 12, 1909. Length, 1,330 mm.

9054. Abuyog, Leyte. July 26, 1909. Length, 1,393 mm.

U.S.N.M. No. 71907. Okinawa, Riu Kiu. *Albatross* collection. Length, 1,330 mm. Spots all small and of scattered appearance, inconspicuous, not extending on head or nape and anterior rows just before middle of disk tending to form broken horizontal pale lines.

#### AETOBATUS OCELLATUS (Kuhl)

*Myliobatis ocellatus* KUHL, *Algemein Konst Letterbode*, p. —, 1823 (type, locality: Java).—VAN HASSELT, *Bull. Sci. Nat. Féruccac*, vol. 2, p. 90, 1824 (Java).

*Aetobatus ocellatus* GARMAN, *Mem. Mus. Comp. Zool.*, vol. 36, p. 442, 1913 (Indian Ocean).

Depth  $5\frac{3}{4}$  in disk length; head 3; disk length  $2\frac{4}{5}$  in its width,  $3\frac{1}{4}$  in tail. Snout  $2\frac{1}{8}$  in head, forms broadly obtuse depressed lobe below and at low level in front; eye  $9\frac{2}{3}$ , 5 in snout,  $6\frac{1}{4}$  in interorbital; dentary width  $3\frac{7}{8}$  in head; teeth uniserial, lower pavement projects slightly; lips papillose; nostrils each deep simple slit, internarial  $1\frac{1}{2}$  in dentary width; interorbital  $1\frac{3}{4}$  in head, broad, slightly convex. Gill openings subequal or last smallest, equidistant. Eye  $1\frac{3}{4}$  in spiracle, which wide and deep.

Skin smooth. No caudal spine.

Dorsal length 4 in head; no anal; tail very long, whiplike; pectoral forms very wide disk, front edges nearly straight, hind edge slightly concave, acute at outer angle; ventral  $1\frac{1}{3}$  in head, expanded terminally and convex behind.

Back brown, marked with many scattered, close-set, whitish spots, becoming smaller about disk edges. Spots also extend well over head, dorsal, ventral and base of tail. Tail largely dusky. Under surfaces dusky.

East Indies, Indian Ocean. I identify the specimen described above with this species as all its white spots appear to have formerly been more brilliant, contrasted and apparently ocellated.

U.S.N.M. No. 39987. South Sea Islands. Australian Museum. Length, 1,100 mm.

#### Genus RHINOPTERA Cuvier

*Rhinoptera* (Kuhl) CUVIER, *Règne animal*, ed. 2, vol. 2, p. 401, 1829. (Type, *Myliobatis marginata* GEOFFROY SAINT-HILAIRE, designated by Fowler, *Geol. Surv. New Jersey Bull.* 4, p. 101, 1911.)

*Zygotobatis* AGASSIZ, *Poissons fossiles*, vol. 3, p. 79, 1838. (Type, *Myliobatis jussieui* Cuvier, monotypic.)

*Zygotobates* AGASSIZ, loc. cit., vol. 3, p. 328, 1843. (Type, *Myliobatis jussieui* Cuvier.)

*Trikeras* HARLESS, *Abh. Nat. Phys. Kl.*, vol. 5, p. 841, 1850. (Atypic.) (Type, *Myliobatis marginata* Geoffroy Saint-Hilaire.)

*Mylorhina* GILL, *Ann. Lyceum Nat. Hist. New York*, p. 139, 1865. (Type, *Rhinoptera lalandii* Müller and Henle, orthotypic). (*Mylorhinus* Boisduval, 1835, in Coleoptera not involved.)

*Micromesus* GILL, Ann. Lyceum Nat. Hist. New York, p. 139, 1865. (Type, *Rhinoptera adspersa* Müller and Henle, orthotypic.)  
*Trycera* (Koch) DÖDERLFIN, Manuale ittiologico Mediterraneo, vol. 3, p. 242, 1885. (Type *Myliobatis typica* Koch = *Myliobatis marginata* Geoffroy Saint-Hilaire.) (Name in synonymy.)

Body, head, and pectorals formed as wide lozenge-shaped disk. Tail long, slender, whiplike, with basal serrated spine. Cranium prominent. Eyes prominent, lateral. Teeth wide, angular, flat, in pavement, median row widest. Spiracles large, behind eyes, open laterally. Dorsal fin above basal part of tail. Pectorals greater developed in front half. Pair of rostral fins, not joined with front of skull and not continuous at sides of head with pectorals.

#### ANALYSIS OF SPECIES

- a<sup>1</sup>.* Teeth in 7 rows; skin smooth..... *javanica*
- a<sup>2</sup>.* Teeth in 9 rows above.
- b<sup>1</sup>.* Median row of teeth and second on each side 3 times wide as long, narrower than row each side of median..... *adspersa*
- b<sup>2</sup>.* Median row of teeth 8 times wide as long, next row 4 times..... *jayakari*

#### RHINOPTERA JAVANICA Müller and Henle

*Rhinoptera javanica* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 182, pl. 58, 1841 (type locality: Java).—BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 6, 1849 (Kammal).—GRAY, List fish British Museum, p. 132 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 89, 1852 (Batavia, Samarang, Soerabaya).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 647, 1865 (Malabar).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 494, 1870 (types of *Rhinoptera affinis* and *Rhinoptera smithii*).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 120, 1874 (China).—DAY, Fishes of India, pt. 4, p. 744, pl. 195, fig. 4 (teeth), 1878 (Kurrachee); Fauna British India, Fishes, vol. 1, p. 61, fig. 25 (teeth), 1889.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Moratabas).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 194, 1904 (locality ?).—SOUTHWELL, Ceylon Administr. Rep., 1912–13, p. E50.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 446, 1913 (Java and India).—PEARSON, Ceylon Administr. Rep., 1915–18, p. F10.—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 465, 1924 (Tale Sap, Singora).—CHARANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>e</sup> note, p. 6, 1926 (Gulf of Siam).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 354, 1929 (Travancore).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 597, 1930 (Hong Kong); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).—UMALI, Philippine Dept. Agri. Comm. Pop. Bull. 6, p. 46, 1936 (Manila).—ROXAS and MARTIN, Dept. Agri. Comm. Manila, Tech. Bull. 6, p. 17, 1937 (reference).—SUWATTI, Index Fish. Siam, p. 8, 1937 (reference).—FOWLER, List Fish. Malaya, p. 20, 1938 (reference).

*Rhinoptera smithii* GRAY, List fish British Museum, p. 494, 1851 (type locality: "Antarctic Seas").

*Rhinoptera truncata* (Van Hasselt) BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 89, 1852 (East Indies). (Name in synonymy.)  
*?Rhinoptera affinis* BLEEKER, Verh. Maatsch. Wet. Haarlem, ser. 2, vol. 18, p. 19 (fetus), 1863 (type locality: Guinea).

Depth  $4\frac{1}{3}$  to 5 in disk length to hind pectoral edge; head  $2\frac{3}{4}$  to 4; disk length  $1\frac{2}{3}$  to  $1\frac{3}{4}$  in its width,  $3\frac{1}{8}$  in tail; head width subequal with its length. Snout width subequal with interorbital, with shallow median notch, tips of rostral fins showing as viewed from above; eye 6 to  $7\frac{1}{2}$  in head,  $4\frac{2}{3}$  to  $5\frac{3}{4}$  in interorbital; mouth width  $1\frac{2}{3}$  to  $1\frac{3}{4}$  in head; upper lip with edge fringed, lower papillate; teeth in 7 rows in jaws, median row  $\frac{1}{3}$  to 7 times as wide as those in lateral rows; outermost row of teeth smallest, wide as long; internarial width  $1\frac{1}{2}$  in mouth width; interorbital  $1\frac{1}{5}$  to  $1\frac{1}{4}$  in head, broad, slightly convex. Gill openings moderate, equidistant, last smallest. Spiracles large, twice eye and closely posterior to eye.

Skin smooth. Caudal spine  $1\frac{1}{2}$  to  $1\frac{2}{3}$  in interorbital.

Dorsal length  $1\frac{4}{5}$  to  $1\frac{7}{8}$  in interorbital; no anal; tail long, slender, whiplike; pectorals falcate, front edges convex, hind edges concave, tips acuminate; ventrals rather long, narrow, end in obtuse inner lobe.

Uniform brown above, below white.

India, Ceylon, East Indies, China.

This species has a much longer tail than Garman describes. It differs from the other Indo-Pacific species *Rhinoptera adspersa* Müller and Henle and *Rhinoptera jayakari* Boulenger in the possession of but 7 rows of teeth in each jaw.

6763. Manila market. April 29, 1909. Length, 660 mm., tail end broken.

6764. Manila market. April 29, 1909. Length, 1,010 mm.

#### RHINOPTERA ADSPERSA Müller and Henle

*Rhinoptera adspersa* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 183, 1841 (India).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1418, 1849 (Pinang).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—GRAY, List fish British Museum, p. 132, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Plagiost.), vol. 24, p. 82, 1852 (Indian Ocean); (Bengal), vol. 25, p. 82, 1853 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 648, 1865 (type).—GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 494, 1870 (East Indies).—DAY, Fishes of India, pt. 4, p. 744, 1878 (Madras); Fauna British India, Fishes, vol. 1, p. 61, 1889.—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 447, 1913 (Indian Ocean).

Snout short and broad; upper teeth in 9 rows, median row and second on each side about equal, each of teeth less than 3 times broad as long, narrower than separating rows; lower teeth in 7 rows, median row wider, other rows narrowing to outer.

Back rough with small stellate based spines.

Dorsal origin little behind ventral bases, tail more than 3 times disk length; pectorals form disk twice wide as long, front edges nearly straight, hind edges concave, outer angles pointed, hind angles straight; cephalic fins rounded, not prolonged.

Greenish brown above, lighter below. Length, 991 mm. (Müller and Henle; Duméril.)

India, Pinang.

RHINOPTERA JAYAKARI Boulenger

*Rhinoptera jayakari* BOULENGER, Ann. Mag. Nat. Hist., ser. 6, vol. 15, p. 141, 1895 (type locality: Muscat, Arabia).—GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 448, 1913 (copied).

Head long as wide. Snout emarginate; mouth width nearly equals preoral length; teeth in 9 rows, those of median upper row 8 times wide as long and nearly twice wide as those adjacent; median lower teeth 6 times wide as long and  $1\frac{1}{2}$  wide as adjacent one.

Skin smooth.

Tail  $2\frac{1}{2}$  in total length; disk  $1\frac{3}{4}$  times broad as long.

Blackish above, whitish beneath. Length, 740 mm. (Boulenger.)  
Arabia. I have no way of distinguishing the imperfectly noticed *Rhinoptera neglecta* Ogilby, which follows.

RHINOPTERA NEGLECTA Ogilby

*Rhinoptera neglecta* OGILBY, Mem. Queensland Mus., vol. 1, p. 32, 1912 (type locality: Moreton Bay, Queensland); vol. 5, p. 89, 1916 (copied).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).

*Rhinoptera javanica* (not Müller and Henle) DEVIS, Proc. Roy. Soc. Queensland, vol. 2, pt. 1, p. 12, 1885 (Moreton Bay).

Nine series of teeth in each jaw, those of median upper series 8 times wide as long and  $1\frac{2}{5}$  times as wide as adjacent series; middle lower teeth little wider than upper. Disk more than twice broad as long. Median notch of snout deep. Disk width, 860 mm.

Queensland. "This unique Australian specimen is unfortunately in such wretched condition as to preclude a more detailed description."

Family MOBULIDAE

Head, body, and pectorals form partly rhomboid disk, wider than long. Tail slender, whiplike. Head broad, flat. Eyes large, lateral. Mouth large, transverse. Teeth small, numerous, in pavement. Gill openings large. Spiracles moderate, behind orbits. Small triangular dorsal on tail, above and between ventrals. Pectorals wide, triangular, not continuous at side of head, acute angled laterally and posteriorly. Cephalic fin as separated section of pectorals, extended forward as hornlike extension from each side. Ventrals small, between pectorals.

Gigantic rays, remarkable for their great width, which sometimes reaches 610 cm. with a weight of 4 tons. They are frequent in tropi-

cal or subtropical seas and are usually found floating near the surface, especially in situations where vast areas of plankton and nekton occur. Their weak dentition and modified branchial apparatus probably serve to strain out the minute organisms, like the branchial strainers of *Cetorhinus* and *Rhincodon*, as the water flows through their gill slits. Owing to their immense size and the fear of native fishermen, specimens are seldom brought to museums intact. Like other large marine animals our knowledge of them is therefore very fragmentary or unsatisfactory and often confused or erroneous.<sup>10</sup> So far as known they are viviparous, producing but several young in a season.

#### ANALYSIS OF GENERA

- a<sup>1</sup>. MOBULINAE.* Mouth inferior; teeth in both jaws or at least in upper jaw. *Mobula*
- a<sup>2</sup>. CEPHALOPTERINAE.* Mouth anterior or terminal; teeth usually only on lower jaw, sometimes in both jaws. *Manta*

#### Genus MOBULA Rafinesque

- Mobula RAFINESQUE*, Indice d'ittiologia siciliana, pp. 48, 61, 1810. (Type, *Mobula auriculata* Rafinesque, monotypic.)
- Apterus RAFINESQUE*, Indice d'ittiologia siciliana, pp. 48, 62, 1810. (Type, *Raja fabroniana* Lacépède, monotypic.)
- Apturus CUVIER*, Hist. Nat. Poiss., vol. 1, p. 215, 1828. (Type, *Raja fabroniana* Lacépède.)
- Cephalopterus* (not Geoffroy Saint-Hilaire 1809) (Duméril) RISSE, Ichth. Nice, p. 14, 1810. (Type, *Raja giorna* Lacépède = *Raja cephaloptera* Schneider, virtually tautotypic.)
- Cephaloptera* (Duméril) CUVIER, Règne animal, vol. 2, p. 138, 1817. (Type, *Raja cephaloptera* Schneider, monotypic.)
- Cephalopteram* GRIFFITH and SMITH, Animal Kingd. Cuvier, Griffith's, vol. 10, p. 17, 1834. (Type, *Raja giorna* Lacépède.)
- Dicerobatus* BLAINVILLE, Bull. Soc. Philom. Paris, vol. 8, p. 121, 1816. (Type, *Raja mobular* BONNATERRE, designated by Jordan and Evermann, Genera of fishes, pt. 1, p. 95, 1917.)
- Dicerobatis* BLAINVILLE, Faune Française, Vertebr., p. 40, 1825. (Type, *Raja mobular* Bonnaterre.)
- Diarobatus* AGASSIZ, Nomenclat. Zool., Pisces, p. 22, 1845. (Type, *Raja mobular* Bonnaterre.)
- Pterocephalus* SWAINSON, Nat. Hist. Animals, vol. 1, pp. 170, 174, 1838. (Type, *Raja cephaloptera* Schneider.) (*Pterocephalus* Schneider 1887, Linstow 1899, Raw 1908, in invertebrates precluded.)
- Pterocephala* SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 319, 1839. (Type, *Raja giorna* Lacépède, monotypic.)

Tail slender, whiplike, with or without serrated spine. Head broad, flat, truncate. Rostrum short, broad, sharp-edged anteriorly. Mouth wide, inferior. Teeth on both jaws, small, numerous, in pavement. Internarial space wide. Dorsal fin between ventrals. Rostral fins

<sup>10</sup> Gill, Smithsonian Misc. Coll., vol. 52, p. 155, figs. 1908.

moderate, distinct from pectorals, directed forward and obliquely downward but rolled from below outward in subcylindrical roll when not in use.

#### ANALYSIS OF SPECIES

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|--|----------|
| <i>a<sup>1</sup>.</i> Serrated caudal spine present----- | japanica |
| <i>a<sup>2</sup>.</i> No serrated caudal spine-----      | diabolus |

#### MOBULA JAPANICA (Müller and Henle)

*Cephaloptera japanica* MÜLLER and HENLE, Syst. Beschreib. Plagiostomen, p. 185, 1841 (type locality: Japan).

*Cephaloptera japonica* SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 310, 1850 (Japan).—GRAY, List fish British Museum, p. 134, 1851 (reference).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 22, 1853 (Japan).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 659, 1865 (copied).—GÜNTHER, Journ. Mus. Godeffroy, pt. 17, p. 498, 1910 (reference).

*Dicerobatis japonica* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 496, 1870 (compiled).

*Aodon japonicus* JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 43, 1901 ("Japan").

*Mobula japonica* JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 666, 1903 (Misaki).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Tokyo).—FOWLER, Bishop Mus. Bull. 38, p. 3, pl. 1, figs. a-c, 1927 (Honolulu).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo, Korea).—FOWLER, Mem. Bishop Mus., vol. 10, p. 26, 1928 (compiled).—TANAKA, Jap. Fish. Life Colours, No. 36, 1933.

*Mobula japonica* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 450, 1913 (Japan).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (Japan; Hawaii).—WHITLEY, Australian Zoologist, vol. 8, pt. 3, p. 187, 1936 (compiled).

I reported an incomplete specimen in 1927 obtained in the Honolulu markets now in the collections of the Bishop Museum.

Teeth bands extend to mouth angles, 84 rows above, 101 rows below.

Head above dark dusky brown, below creamy white. Eye pale. Edge of lower lip and upper snout edge neutral gray, also inner surfaces of cephalic fins.

#### MOBULA DIABOLUS (Shaw)

*Raja diabolus* SHAW, General zoology, vol. 5, p. 291, 1804 (on *Eregoodoo-tenkee* Russell, Fishes of Coromandel, vol. 1, p. 5, pl. 9, 1803, type locality: Vizagapatam).—SWAIN, Proc. Acad. Nat. Sci. Philadelphia, 1882, p. 308 (on Shaw).

*Mobula diabolus* WHITLEY, Australian Zoologist, vol. 8, pt. 3, p. 185, 1936 (Brisbane; India; New Hebrides).

? *Raja bankiana* LACÉPÈDE, Hist. Nat. Poiss., vol. 2, p. 115, pl. 5, fig. E, 1800 (type locality: East Indies).

*Raija eregoodoo-tenkee* CUVIER, Règne animal, vol. 2, p. 402, 1829 (on *Eregoodoo-tenkee* Russell, Fishes of Coromandel, vol. 1, p. 5, pl. 9, 1803, Vizagapatam).

- Mobula eregoodoo-tenkee* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 451, 1913 (Indian Seas, Malay Archipelago, Red Sea).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1918, p. 2 (Philippines); vol. 79, p. 256, 1927 (same example); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference); List Fish. Malaya, p. 20 (246), 1938 (reference).
- Mobula eregoodoo-tenke* FOWLER, Copeia, No. 58, p. 62, 1918 (same example).
- Dicerobatis eregoodoo* CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1420, 1849 (type locality: Pinang).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 149, 1851.—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 9, 1853 (on *Eregoodoo tenkee* Russell).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 497, 1870 (Indian Seas).—DAY, Fishes of India, pt. 4, p. 744, pl. 193, fig. 1, 1878 (Jerdon's example); Fauna British India, Fishes, vol. 1, p. 62, fig. 26, 1889.—BOULENGER, Proc. Zool. Soc. London, 1889, p. 244 (Muscat).—KENT, Great Barrier Reef, p. 370, pl. 48, figs. 2–3, 1893 (Palm Islands).—LLOYD, Rec. Indian Mus., vol. 2, p. 179, text, fig. 2 (teeth), pl. 4, fig. 1, 1908 (Madras).—ZUGMAYER, Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 26, p. 9, 1913.
- Dicerobatus eregoodoo* WOOD JONES, Proc. Zool. Soc. London, 1909, p. 144 (Cocos Keeling Atoll).
- Dicerobatis eregoodoo* PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 354, 1929 (Travancore).
- Cephaloptera eregoodoo* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 655, pl. 6, figs. 2–3 (teeth), 1865 (compiled).
- Mobula eregoodoo* OGILBY, Mem. Queensland Mus., vol. 5, p. 90, 1916 (Moreton Bay); vol. 6, p. 97, 1918 (Moreton Bay).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (reference).—McCULLOCH, Australian Mus. Mem., vol. 5, p. 31, 1929 (Queensland).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 17, 1937 (reference).
- Cephaloptera tatraniana* VAN HASSELT, Allgem. Konst- en Letterb., vol. 1, p. 316, 1823 (on *Eregoodoo tenkee* Russell, 1803).
- Cephaloptera kuhlii* (Valenciennes) MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 185, pl. 59, fig. 1, 1841 (type locality: India).—GRAY, List fish British Museum, p. 134, 1851 (reference).—BLEEKER, Act. Soc. Sci. Indo-Néerl., vol. 3, no. 7, pp. 1, 6, 1858 (Amboina).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 654, pl. 6, figs. 9–9a (teeth), 1865 (type).—VORDERMANN, Nat. Tijdschr. Nederland. Indië, vol. 56, p. 40, 1897.
- Dicerobatis kuhlii* BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 82, 1853 (reference).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 497, 1870 (type; Zanzibar).—DAY, Fishes of India, pt. 4, p. 745, 1878; Fauna British India, Fishes, vol. 1, p. 63, 1889.—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 510, 1891.—WEBER, in Semon's Zool. Forsch. Reis. Australia, vol. 5, p. 276, 1895 (Amboin).
- Mobula kuhlii* MILLAR, Zoologist, No. 694, p. 145, pl. 1, 1899 (Durban).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 86, pl. 5, fig. 2, 1925 (Natal).
- Mobula kuhlii* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 452, 1913 (Indian Ocean, East Indies, Japan).—FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).—WHITLEY, Australian Zool., vol. 8, pt. 3, p. 186, 1936 (compiled).
- Cephaloptera olfersii* (not Müller) GRAY, List fish British Museum, p. 133, 1851 (Indian Ocean).
- Dicerobatis monstrum* KLUNZINGER, Vehr. zool.-bot. Gess. Wien. vol. 21, p. 687, 1871 (type locality: Red Sea).
- Mobula monstrum* WHITLEY, Australian Zool., vol. 8, pt. 3, p. 186, 1936 (compiled).

*Dicerobatis draco* GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 10, p. 422, 1872  
(type locality: Misol).

*Mobula draco* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 451, 1913 (Misol).—  
FOWLER, Proc. 4th (1929) Pacific Sci. Congr., Java, p. 507, 1930 (reference).—WHITLEY, Australian Zool., vol. 8, pt. 3, p. 186, 1936 (compiled).

*Dicerobatis thurstoni* LLOYD, Rec. Indian Mus., vol. 2, p. 179, fig. 3, pl. 4, fig.  
2, 1908; vol. 26, pt. 6, p. 9, 1913 (type locality: Mekran and Oman).

*Mobula thurstoni* WHITLEY, Australian Zool., vol. 8, pt. 3, p. 187, 1936 (copied).

Depth  $5\frac{1}{2}$  in disk measured from median concavity of snout to hind pectoral edge; head 4; disk length  $1\frac{3}{4}$  in its width,  $1\frac{1}{2}$  in tail; head width little greater than its length. Tip of rostral flap to eye  $1\frac{1}{4}$  in head; eye  $5\frac{3}{4}$ ,  $6\frac{1}{2}$  in interorbital; mouth width  $1\frac{1}{4}$  in head; teeth in 50 to 52 rows in jaws; internarial space slightly less than mouth width; interorbital slightly greater than head length, nearly level or only very slightly convex. Gill openings large, second to fourth largest or  $4\frac{1}{2}$  in interorbital, last  $\frac{4}{5}$  of third. Spiracle small, inconspicuous below ridge and in deep wide groove, about size of pupil.

Skin smooth. No caudal spine.

Dorsal length  $2\frac{1}{4}$  in interorbital, ends little before hind ventral ends; no anal; tail long and whiplike; pectorals falcate, angles acute and rather sharp, front edges of fin nearly straight and hind edges concave; ventrals small, rather long, ends obtuse.

Brown above, paler to whitish below, with pectorals terminally little brownish.

Red Sea, Arabia, India, Pinang, East Indies, Philippines, Queensland. Although Garman has accepted 4 species in this genus without a serrated caudal spine I cannot believe that the distinctions, based on the width of the dental bands and the length of the tail are satisfactory. Day gives the dentition as 340 upper and 360 lower teeth in jaw 12 inches across gape and 5,490 mm. (18 feet) wide; one 4 inches across jaws had 240 rows above and 244 below; Cantor gives 80 teeth above and 95 below for an example 30 inches (663 mm.) wide. Garman gives the teeth in *Mobula kuhlii* as 44 rows above and 54 below in an example 420 mm. wide. Duméril separates *Cephaloptera kuhlii* on the dental plate entire behind and with but 36 to 38 rows of teeth, while in the present species he gives the dental plate emarginate behind and the rows of teeth about 80. As he had Müller and Henle's type of the former he gives the disk width 740 mm. In Günther's *Dicerobatis draco* the disk is 384 mm. wide and the upper teeth are said to be in 46 series. It was supposed by Garman to differ in the longer tail, which about equals  $2\frac{1}{2}$  disk lengths.

5705. Manila market. May 4, 1908. Length, 1,038 mm.

1 example. A.N.S.P. Philippines. Commercial Museum of Philadelphia.  
Disk length, 254 mm.

## Genus MANTA Bancroft

*Manta* BANCROFT, Zool. Journ., vol. 4, p. 144, 1828-29. (Type, *Cephalopterus manta* Bancroft, monotypic).

*Ceratoptera* MÜLLER and HENLE, Sitz. Ber. Akad. Wiss. Berlin, 1837, p. 118. (Atypic; Arch. Naturg., 1837, p. 401.) (Type, *Cephalopterus giorna* (not Lacépède) Lesueur, virtual orthotype.)

*Brachioptilon* NEWMAN, Zoologist, vol. 7, p. 2396, 1849. (Type, *Brachioptilon hamiltoni* Newman, monotypic.)

*Diabolichthys* HOLMES, Proc. Elliott Soc. Nat. Hist., vol. 1, p. 39, 1856. (Type, *Diabolichthys elliotti* Holmes, monotypic).

*Diabolichthys* MARSHALL, Nomenclat. Zool., p. 72, 1877. (Type, *Diabolichthys elliotti* Holmes.)

*Daemomanta* WHITLEY, Rec. Australian Mus., vol. 18, No. 6, p. 327, 1932. (Type, *Manta alfredi* Stead, orthotypic.)

*Desmomanta* FOWLER, Mem. Bishop Mus., vol. 11, No. 6, p. 386, 1934. (Type, *Manta alfredi* Stead.) (Error.)

*Indomanta* WHITLEY, Australian Mus. Mag., vol. 6, p. 11, 1936. (Type, *Indomanta tombazii* Whitley, orthotypic.)

Head greatly depressed, broad, flat, truncate. Rostrum short, broad. Eyes prominent, lateral. Mouth large, very wide, straight, anterior or terminal with narrow edges to jaws. Teeth present only as lower dental plate, very small, close-set, numerous. Internarial very wide. Gill openings wide. Skin rough with small prickles. Rostral fins distinct from pectorals, directed or rolled forward. Small dorsal between ventrals. Tail slender, whiplike, without serrated spine on caudal. Pectorals form wide disk, greatly wider than long, outer angles acute.

Giant rays of tropical seas and though several species have been described perhaps referable to one or two species. Fossil fragments also have been referred to the genus.

## MANTA BIROSTRIS (Walbaum)

*Raja birostris* WALBAUM, Artedi Pisc., vol. 3, p. 535, 1792 (on *Diabolus marinus* Willoughby, Hist. Pisc. Append., p. 5, pl. 9, fig. 3, 1686; no type locality).—*Divel* PENNANT, Arctic zoology, vol. 2, pt. 4, p. 354, 1792, copied.—CATESBY, Nat. Hist. Carolina, Append., p. 32, 1771 (type locality: Carolina).

*Manta birostris* FOWLER, Occ. Pap. Bishop Mus., vol. 8, No. 7, p. 375, 1923 (Honolulu); Bishop Mus., Bull. 28, p. 4, pl. 1, figs. d-g, 1927 (Fanning Islands); Mem. Bishop Mus., vol. 10, p. 26, 1928 (Honolulu, off Oahu); Proc. 4th (1929) Pacific Sci. Congr., Java, p. 508, 1930 (Fanning and Hawaiian Islands); Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (on Ogilby's New Hebrides *Ceratoptera*).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 25, 1936 (Cocos Island; Galapagos).—WHITLEY, Australian Zool., vol. 8, pt. 3, p. 179, 1936 (compiled).

*Raja banksiana* LACÉPÈDE, Hist. Nat. Poiss., vol. 2, p. 105, pl. 5, fig. 3, 1800 (type locality: East Indies).

*Manta?* *banksiana* WHITLEY, Australian Zool., vol. 8, pt. 3, p. 180, 1936 (compiled; Nauru and Solomons).

*Raia fimbriata* LACÉPÈDE, Hist. Nat. Poiss., vol. 4, pp. 671, 677, pl. 16, fig. 3, 1802 (type locality: North Atlantic Ocean).

- Raja manatia* SCHNEIDER, Syst. Ichth. Bloch, p. 364, 1801 (type locality: Tropical America).
- Cephalopterus vampyrus* MITCHILL, Ann. Lyceum Nat. Hist. New York, vol. 1, p. 23, pl. 2, fig. 1, 1824 (type locality: Near entrance to Delaware Bay).
- Cephaloptera giorna* (not Lacépède) LE SUEUR, Journ. Acad. Nat. Sci. Philadelphia, vol. 4, p. 115, pl. 6, 1824 (type locality: Georgia).
- Raia cornuta* LE SUEUR, op. cit., p. 120 (on Catesby).
- Cephalopterus manta* BANCROFT, Zool. Journ., vol. 4, p. 453, 1828-29 (type locality: Jamaica).
- Manta americana americana* BANCROFT, op. cit., p. 454 (type locality: Jamaica).
- Ceratoptera lesueurii* SWAINSON, Nat. Hist. Animals, vol. 2, p. 320, fig. 100, 1839 (on LeSueur 1824).
- Ceratoptera johnii* MÜLLER and HENLE, Syst. Beschr. Plagiost. p. 186, pl. 49, 1841 (type locality: Jamaica).
- Ceratoptera chrenbergii* MÜLLER and HENLE, Syst. Beschr. Plagiostomen, p. 187, 1841 (type locality: Red Sea).—GRAY, List Fish Brit. Mus., p. 134, 1851 (reference).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 661, 1865 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 498, 1870 (compiled).—KLUNZINGER, Vehr. zool. bot. Ges. Wien, vol. 21, p. 687, 1871 (Red Sea).—DAY, Fishes of India, pt. 4, p. 745 (not woodcut), 1878.—BARTLETT, Sarawak Gazette, vol. 26, No. 366, p. 134, 1896 (Moratabas).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21 (1903), p. 194, 1904 (Jeram).
- Manta ehrenbergii* GARMAN, Mem. Mus. Comp. Zool., vol. 36, p. 455, 1913 (compiled).—WHITLEY, Australian Zool., vol. 8, pt. 3, p. 183, 1936 (compiled).—FOWLER, List Fish. Malaya, p. 20, 1938 (reference).
- Manta ehrenbergii* BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 87, 1925 (Table Bay, East London, Durban, Natal).
- Brachioptilon hamiltoni* NEWMAN, Zoologist, vol. 7, p. 74, 1849 (type locality: Gulf of California, west coast of Mexico).
- Manta hamiltoni* BEEBE, The Areturus adventure, pp. 123, 134, 206, 304, 415, figs. 30-35, 1926 (Galapagos).—WHITLEY, Australian Zool., vol. 8, pt. 3, p. 180, 1936 (compiled).
- Diabolichthys elliotti* HOLMES, Proc. Elliott Soc. Nat. Hist., vol. 1, p. 39, 1856 (type locality: Charleston, S. C.).
- Deratoptera alfredi* KREFFT, Illustrated Sydney News, vol. 5, pp. 3, 9, wood-cut fig., 1868 (type locality: Port Jackson, New South Wales).
- Ceratoptera alfredi* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 381, 1881 (Manly Beach).—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 23, 1888 (type; Port Jackson).
- Manta alfredi* STEAD, Fishes of Australia, p. 233, 1908 (Port Jackson).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 13, pl. 3, fig. 43a, 1927 (photograph).—FOWLER, Proc. 4th (1929) Pac. Sci. Congr., Java, p. 508, 1930 (reference).
- Daemomanta alfredi* WHITLEY, Rec. Australian Mus., vol. 18, No. 6, p. 328, pl. 37, figs. 1-4, 1932 (compiled records and notes); Australian Zoolologist, vol. 8, pt. 3, p. 167, pl. 12, text figs. 1-3, 1936 (Maher Island, Queensland).
- Cephaloptera stelligera* (Ehrenberg) GÜNTHER, Cat. Fishes British Museum, vol. 8, p. 498, 1870 (name in synonymy).—HILGENDORF, Symbol. Physie. Hemprich-Ehrenberg, pl. 2, figs. 1-9, 1899 (type locality: Red Sea).
- Manta raya* BAER, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 112, 1899 (type locality: Zorritos, Peru).

- Mobula japonica* (not Müller and Henle) JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), p. 50, 1905 (Honolulu).
- Ceratoptera orissa* LLOYD, Rec. Indian Mus., vol. 2, p. 176, fig. 1, pls. 5-10, figs. 1-2, 1908 (type locality: Puri).
- Manta orissa* WHITLEY, Australian Zool., vol. 8, pt. 3, p. 181, 1936 (compiled).
- Indomanta tombazii* WHITLEY, Australian Mus. Mag., vol. 6, p. 11, 1936 [on *Dicerobatis*, not Cantor, Tombazi, Journ. Bombay Nat. Hist. Soc., vol. 37, p. 227, pl. 1934 (type locality: Cape Mouze, 20 miles from Karachi, India)]; Australian Zool., vol. 8, pt. 3, p. 183, 1936 (copied).
- Manta pinchoti* WHITLEY, op. cit., p. 182 (type locality: Marquesas Islands) (on *Manta birostris* Fowler, 1932).
- Manta fowleri* WHITLEY, op. cit., p. 182 (type locality: Fanning Islands) (on *Manta birostris* Fowler, 1927).
- Manta pakoka* WHITLEY, op. cit., p. 183 (type locality: Uaar Hat Island, Teuaua, Ua Huka, Marquesas Islands) (on *Pakoka* Pinchot, To the South Seas, pp. 406, 408, 421, fig., 1930).

Head width  $3\frac{2}{3}$  in total length; head length to first gill opening  $3\frac{2}{3}$  in its own width. Snout very broad, as seen above with broadly concave profile; eye lateral, equally visible above and below, about 14 across interorbital; mouth width  $2\frac{3}{4}$  in disk length, or  $6\frac{2}{5}$  in greatest disk width; dental plate below with 143 teeth in transverse series; interorbital widely depressed, slopes convexly down each side. First pair of gill openings  $1\frac{1}{5}$  in interspace, likewise smaller last pair.

Skin with rough asperities, each of larger with radiated bases.

Triangular dorsal fin over ventrals, with hind truncate edge ending little before hind ventral edges, fin length  $5\frac{1}{5}$  in disk length to middle of front snout edge; tail slightly longer than disk length, without spine; disk length  $2\frac{2}{7}$  in disk width, widest midway in its length, outer angles narrowly triangular and curved backwards, front edges little convex and hind edges concave; ventral ends extend little beyond hind pectoral edges, obtuse.

Above blackish or dark olive, below whitish. Length, 1773 mm. (Hilgendorf.)

Red Sea, Natal, South Africa, India, Malay Peninsula, East Indies, New South Wales, Melanesia, Polynesia, Hawaii. I have long thought the Polynesian and Hawaiian specimens with 150 teeth in the dental plate were the Atlantic *Manta birostris* Walbaum. Hilgendorf's figure of a Red Sea specimen, however, shows only 143 teeth and Barnard mentions a South African specimen with 230. Garman maintains the Atlantic species with the dental plate extending over the whole width of the lower jaw bearing about 100 separated rows of teeth, at least in the young.

The following is Macleay's account of *Ceratoptera alfredi* Krefft:

"This is the name affixed to a stuffed specimen of this genus of enormous size, in the Australian Museum. It was captured at Manly

Beach in 1868, and was considered by Mr. Krefft as new and undescribed species, but unfortunately he never described it, and description is now impossible, so much painting and puttying and clipping have been practised in setting up the specimen."

## Subclass HOLOCEPHALI

Body massive, compressed. Tail and caudal region attenuated. Upper jaws and other palatal cartilages joined with skull. Dental plates in 3 pairs, vomerine and palatine above, mandibular below. Opercles rudimentary. One gill opening each side of pharynx, contains 4 gill clefts and 4 gills united with skin terminally. No spiracles, except in embryonic stages. Skull without system of membrane bones, as opercles, suborbitals, etc. Skeleton cartilaginous. No distinct suspensorial cartilage for lower jaw. Vertebrae imperfect, coalescent anteriorly. Brain massed posteriorly, more distributed forward, hemispheres distant from optic lobes and attached to them by nerve-like thread. Intestine with spiral valve. Skin naked, muciferous system highly developed. Dorsal fin erectile, with spine. Pectorals normal, low. Ventrals abdominal. Mature males with erectile frontal tentacle and prepelvic claspers.

The living chimaeroids are a divergent and modified branch of some primitive sharklike type. Besides certain characters of the bony fishes they have acquired others distinctively their own. Their relation to the elasmobranchs is seen in their cartilaginous skeleton, dermal denticles, the brain structure and especially the reproductive organs. The large eggs and their enclosure in horny coverings is another interesting feature in common. The single gill opening is modified toward the bony fish type, also the structure of the gill filaments, the presence of an opercle, the rectum opening externally before the urino-genital apertures and not into a cloaca.

Six families are admitted and of these three are represented by a few living forms. The fossils are, however, very numerous and date from Paleozoic time. As but few forms are known outside the Indo-Pacific I have included all the living forms, based chiefly on Garman's memoir.

### ANALYSIS OF FAMILIES

- a<sup>1</sup>. CHIMAEROIDEI. Snout prominent; soft, without proboscis; claspers trifid, rarely bifid----- Chimaeridae
- a<sup>2</sup>. CALLORHINCHOIDEI. Snout produced, more or less as proboscis; claspers simple.
  - b<sup>1</sup>. Snout produced in long simple beak----- Rhinochimaeridae
  - b<sup>2</sup>. Snout produced into leaf-shaped flexible appendage----- Callorhinchidae

## Order CHIMAEROIDEI

Snout prominent, soft, without proboscis. Claspers trifid, rarely bifid.

### Family CHIMAERIDAE

Body elongate, rather robust anteriorly, tapering posteriorly to point at tail. Head large, compressed, without proboscis. Mouth small, inferior, upper lip deeply notched. Jaws with teeth confluent into 4 bony laminae or tritors above, 2 below, receive impact on edges. Nostrils confluent with mouth separated by narrow isthmus. Free gills 3 and one-half gill each side. Gill rakers small. Isthmus moderate. No spiracles. Notochord surrounded with narrow ring-like segments. Cerebral hemispheres fused with olfactory lobes distant from optic lobes. Skin naked, rarely somewhat prickly. Lateral line open canal, usually with numerous branches anteriorly or on head. Oviparous, egg-cases long, elliptical, with silky filaments. Mature male with erectile "frontal holders" on forehead and prepelvic tenacula. Dorsal usually divided, anteriorly short and with very strong spine, grooved behind. Second dorsal long and low. Caudal narrow, tapering, subcaudal with extended lobe. Pectorals large, free, low. Ventrals abdominal, many rayed. Mature males with trifid claspers, rarely bifid.

The living forms are remarkable for their striking appearance. Most are found in deep water or cool seas. About 17 genera described, all extinct and only *Chimaera* persisting to recent time.

### Genus CHIMAERA Linnaeus

*Chimaera* LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 236, 1758. (Type, *Chimaera monstrosa* Linnaeus, designated by Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 54, 1883.) (Poli, 1791, in Mollusca and Ochsenheimer, 1808, in Microlepidoptera precluded.)

*Chimoera* CUVIER, Tabl. Element. (an. 6), p. 317, 1798. (Type, *Chimaera monstrosa* Linnaeus.)

*Chimera* RAFINESQUE, Analyse de la nature, p. 92, 1815. (Type, *Chimaera monstrosa* Linnaeus.)

*Chimaira* DUMÉRIL, Mem. Acad. Sci. France, vol. 27, p. 155, 1856. (Type, *Chimaera monstrosa* Linnaeus.)

*Plethodus* DIXON, Fossils of Sussex, p. 366, 1850. (Type, *Plethodus expansus* Dixon, monotypic.) (Fossil.)

*Hydrolagus* GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 331. (Type, *Chimaera colliei* Lay and Bennett, monotypic.)

*Dipristis* GERVAIS, Zool. Pal. Générale, p. 240, 1869. (Type, *Dipristis chimaeroides* Gervais, monotypic.) (Fossil.)

*Bathyhalope* COLLETT, Arch. Naturv. Christiania, vol. 23, p. 5, 1901; Forh. Vid. Selskr. Christiana, No. 9, 1904, p. 5, 1905. (Type, *Chimaera (Bathyhalope) mirabilis* Collett, monotypic.)

*Psychichthys* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1907, p. 419. (Type, *Hydrolagus waitei* Fowler, orthotypic.)  
*Phasmichthys* JORDAN and HUBBS, Mem. Carnegie Mus. vol. 10, p. 119, 1925.  
 (Type, *Chimaera mitsukurii* Dean.)

Head partly conic, compressed. Snout soft and fleshy, conspicuous, large, blunt. Eye large or moderate, lateral. Mouth inferior. Tritors or dental laminae rodlike. Lips thick, lower with frenum. Gill opening small. Skin smooth. Lateral line on head with zigzag openings. First dorsal triangular. Anal present, distinct or joined with subcaudal, or rudimentary.

According to Smitt: "In the seventeenth century Kentman sent to Gesner a drawing of a fish from Denmark which he called Meeraff (*Simia marina*); and when Linnaeus found the same kind of fish from Bohuslän in the Royal Museum at Ulriksdal, he called it Monkey-fish or Monster-fish (*Chimaera*). 'Master is the name given to this fish which is so unlike all others and as it were a medley of all fishes. At certain seasons when this strange fish dieth and is cast ashore, the common people behold in him a miracle and imagine that they see laces, points, topknots, and other finery, which they believe have so displeased the great God that He hath seen good to warn them with signs and wonders, which belief news-men, no less wise than they, speed the whole world through to the edification of all'. Thus the name of *Chimaera* was introduced into ichthyology; and though the monstrosity formerly seen in the structure of the genus has disappeared in the light of modern researches into its relations to the other Elasmobranchs, the life led by these fishes is still in great part a mystery to us."

#### ANALYSIS OF SPECIES

- a<sup>1</sup>. Anal fin distinct from subcaudal.
- b<sup>1</sup>. CHIMAERA. Caudal filament long; eyes large.
  - c<sup>1</sup>. Lateral line in short even waves on flank.
    - d<sup>1</sup>. Claspers bifid  $\frac{2}{3}$  their length.
      - e<sup>1</sup>. Tritors 5 to 7 on each vomerine----- *monstrosa*
      - e<sup>2</sup>. Tritors 3 on each vomerine----- *pseudomonstrosa*
    - d<sup>2</sup>. Claspers bifid  $\frac{1}{2}$  their length----- *phantasma*
  - c<sup>2</sup>. Lateral line irregular, not waved; claspers divided  $\frac{1}{3}$  their length.
    - e<sup>1</sup>. Iridescent dusky, blackish below----- *jordani*
    - e<sup>2</sup>. Mottled light, tail with light streaks----- *owstoni*
- b<sup>2</sup>. Caudal filament short.
  - f<sup>1</sup>. PSYCHICHTHYS. Eyes small; second dorsal not indented.
    - g<sup>1</sup>. First dorsal origin little behind gill opening.
      - h<sup>1</sup>. First dorsal  $1\frac{1}{2}$  in head; pectoral reaches beyond ventral origin----- *purpurescens*
      - h<sup>2</sup>. First dorsal  $1\frac{1}{2}$  in head; pectoral reaches  $\frac{1}{2}$  to ventral----- *eidolon*
    - g<sup>2</sup>. First dorsal origin over gill opening.
      - i<sup>1</sup>. First dorsal  $1\frac{2}{3}$  in head----- *affinis*
      - i<sup>2</sup>. First dorsal little greater than head----- *waitei*

- f<sup>2</sup>. HYDROLAGUS.* Eyes large; second dorsal indented; body with white spots.
- j<sup>1</sup>.* Second dorsal deeply indented; caudal filament usually short----- *colliei*
- j<sup>2</sup>.* Second dorsal scarcely indented; caudal filament but little less than rest of body----- *novae zealandiae*
- a<sup>2</sup>. BATHYALOPEX.* No distinct anal fin.
- k<sup>1</sup>.* Eye large.
- l<sup>1</sup>.* Second dorsal not indented; lateral line straight, entire, irregular but not in short waves.
- m<sup>1</sup>.* Claspers trifid half their length.
- n<sup>1</sup>.* Blackish above, clouded lighter, below dark sepia; vertical fins nearly black--- *mitsukurii*
- n<sup>2</sup>.* Blackish, with white spots----- *barbouri*
- m<sup>2</sup>.* Claspers divided half their length; dorsal spine 1½ head lengths; dark brown, fins purplish black.
- africana*
- l<sup>2</sup>.* Second dorsal deeply indented; dark brown.
- o<sup>1</sup>.* Dorsal spine long as head----- *deani*
- o<sup>2</sup>.* Dorsal spine 1½ in head----- *mirabilis*
- k<sup>2</sup>.* Eye moderate; lateral line with short even waves on side; brownish, with spots and narrow bands.
- ogilbyi*

#### Subgenus CHIMAERA Linnaeus

##### CHIMAERA MONSTROSA Linnaeus

*Chimaera monstrosa* LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 236, 1758 (type locality: Atlantic Ocean); ed. 12, vol. 1, p. 401, 1766.—BLOCH, Naturg. ausländ. Fische, vol. 1, p. 61, pl. 124, 1785 (North Sea).—BONNATERRE, Tableau Encyclop. Ichth., p. 13, pl. 8, fig. 25, 1788 (northern seas).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1488, 1789 (Atlantic and North Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 587, 1792 (on Bloch).—LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 392, pl. 19, fig. 1, 1798 (northern sea).—SCHNEIDER, Syst. Ichth. Bloch, p. 349, 1801 (on Linnaeus).—LAY and BENNETT, Zool. Beechey's Voy., Fishes, p. 72, pl. 23, fig. 3 (ventral fin and clasper), 1839.—GRAY, List fish British Museum, p. 21, 1851 (no locality).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 686, pl. 13, figs. 3–4, pl. 14, fig. 1, 1865 (Cape of Good Hope).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 349, 1870 (North Atlantic materials).—GOODE and BEAN, Oceanic ichthyology, p. 31 (not fig. 31) 1895 (compiled).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 84, 1911 (North Atlantic, to 600 fathoms or more).—ROULE, Res. Comp. Sci. Monaco, vol. 52, p. 126, 1919 (Azores, 1,165 meters; west of Fayal, 1,962 meters).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 94, 1925 (off Cape Point and Saldanha Bay, in 450–500 fathoms).

*Chimaera argentea* ASCANIUS, Icon., vol. 2, p. 6, 1772 (type locality: "On trouve ce poisson depuis Tronhiem jusques au Sund").

*Chimaera praecisa* WALBAUM, Artedi Pisc., vol. 3, p. 588, 1792 (on *Callorhynchus americanus* Gronow, Act. Helvet., vol. 3, p. 49, 1772, type locality: American Ocean).

*Chimaera americana* SCHNEIDER, Syst. Ichth. Bloch, p. 350, 1801 (on Gronow 1772, type locality: American Ocean).

*Chimaera borealis* SHAW, General zoology, vol. 5, p. 365, pl. 157, 1804 (type locality: Northern Ocean).

- Chimaera mediterranea* RISSO, Hist. Nat. Europe mérid., Poissons, vol. 3, p. 168, 1826 (type locality: Nice).
- Chimaera cristata* FABER, Nat. Fische Islands, p. 45, 1829 (type locality: Iceland).
- Chimaera arctica* GISTEL, Naturg. Thierreichs, vol. 8, p. 103, 1848 (type locality: Northern Seas).
- Callorynchus centrina* GRAY, Cat. Fish Gronow, vol. 2, p. 15, 1854 (type locality: American Ocean).
- Callorynchus atlanticus* GRAY, Cat. Fish Gronow, vol. 2, p. 16, 1854 (type locality: Atlantic Seas).
- Chimaera vallanti* DEAN, Carnegie Inst. Washington Publ. No. 32, p. 7, 1906 (type locality: Cape of Good Hope).

Depth  $7\frac{1}{3}$  to  $8\frac{1}{2}$  in total length; head  $6\frac{1}{2}$  to  $7\frac{1}{4}$ . Snout  $2\frac{1}{4}$  to  $2\frac{3}{4}$  in head; mouth before eye; vomerine dental plates with 5 to 7 tritors; interorbital low. Gill rakers 12 short points.

Lateral line irregular though without distinct even waves.

First dorsal inserted over hind gill opening edge, spine  $1\frac{1}{3}$  to  $1\frac{2}{5}$  in head, front and hind edges finely serrated and fin joined with second dorsal by low fold; second dorsal  $2\frac{3}{5}$  to  $2\frac{2}{3}$  in total, uniformly low; anal slightly less than eye, in male little before supracaudal and in female encroaches below front of supracaudal; in male subcaudal little longer than supracaudal, in female subequal; caudal filament  $3\frac{1}{2}$  to 4 in rest of body; pectoral 5 to  $5\frac{1}{5}$  in total, reaches ventral bases, width 2 in its length; ventral  $1\frac{1}{4}$  to  $1\frac{1}{2}$  in head, triangularly pointed.

Back reddish brown, lighter or darker. Sides mostly silvery, shading to blue above, below white. Under silvery luster of sides dorsal color spreads in curious figures, oblong spots, arranged in longitudinal rows, sinuous, indefinite patches kind of marbled pattern thus formed. Silvery lateral line marked by brown edges. Iris golden or silvery, pupil greenish. Vertical fins like back, caudal with black margin more or less forward along second dorsal and upper hind edge of first dorsal. Paired fins like back, anterior or under surface lighter with rays of ashy gray. Inside mouth and pharynx more or less black, tongue and branchial arches yellowish. Said to reach 1,200 mm. (Smitt.)

South Africa. Also North and middle Atlantic and Mediterranean.

2 examples. A.N.S.P. Italy. C. L. Bonaparte. No. 252. Articulated skeletons.

#### CHIMAERA PSEUDOMONSTROSA Fang and Wang

*Chimacra pseudomonstrosa* FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 280, fig. 28, 1932 (type locality: Tsingtau).

Depth subequal with head length; head 5 or less to subcaudal origin, width 2 in its length. Snout  $2\frac{1}{6}$  in head; eye  $4\frac{1}{2}$ , 2 in snout, greater than interorbital; mouth small, inferior, with thick lips;

teeth 2 above, 2 below, edges of each tooth strongly concave, more or less ridges at inner surface, and lower teeth much longer than upper; 3 elongate tritors on each of vomerine dental laminae, 1 anterior, 2 posterior and large one at inner basal wall of each lower tooth; nostrils large, close together, confluent with mouth corners.

Lateral line wavy from anterior to second dorsal origin, less so hindward, nearly straight behind middle of second dorsal; an upward curve below dorsal spine and a gentle downward curve above origin, running posteriorly along base of subcaudal.

First dorsal spine  $1\frac{1}{10}$  in head, strong erectile spine keeled in front and grooved, serrated at hind edge of terminal portion and followed by low dermal fold; fin triangular, short, deep, arises directly behind head; low second dorsal uniformly high, begins just behind tip of depressed dorsal spine, 3 times long as head, not indented on upper edge, reaches supracaudal origin; anal small, rises slowly, separated from subcaudal by narrow notch; caudal fin low, rises slowly in front gradually descends behind; pectoral  $1\frac{1}{4}$  times head, width  $1\frac{3}{4}$  in length, extends beyond ventral base; ventral inserted little behind second dorsal origin, premedian in fish.

Color in formalin pale, somewhat dusky on dorsal side. Body with dark, longitudinal broken streaks, darker along lateral line. Fins grayish silvery.

Length, 980 mm. (Fang and Wang.)

China. Said to be very closely related to *Chimaera monstrosa* of the Atlantic, differing in having 3 tritors on each vomerine instead of 5 to 7, and one more on inner wall of each tooth of lower jaw.

#### CHIMAERA PHANTASMA Jordan and Snyder

*Chimaera phantasma* JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 338, 1900 (type locality: Tokyo); Annot. Zool. Japon., vol. 3, p. 43, 1901 (Nagasaki; Goto Is.; Yeso; Yokohama).—JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 670, 1903 (type).—DEAN, Journ. Coll. Sci. Tokyo, vol. 19, art. 3, p. 3, pl. 1, figs. 3–4, 1904 (Misaki).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 27, p. 223, fig. 1, 1904 (type).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 87, 1911 (Sagami Bay).—H. M. SMITH, Proc. U. S. Nat. Mus., vol. 42, p. 231, 1912 (Verde Island Passage; northern Mindanao).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 185, 1920 (Tokyo market).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 116, 1925 (Osaka market; Sagami Bay).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Mokpo, Korea).—LIN, Sci. Rep. Nat. Tsing Hua Univ., ser. B, vol. 1, p. 173, figs. 15–15a, 1932 (Tsingtao).—TANAKA, Jap. Fish. Life Colours, No. 37, 1933.—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull., 6, p. 17, 1937 (reference).

*Chimaera monstrosa* (not Linnaeus) SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pt. 15, p. 300, pl. 132, 1850 (iles Goto).—BLEEKER Verh. Batav. Genootsch. (Japan), vol. 25, p. 21, 1853 (Goto, Japan).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 16, 1931 (Misaki; Nagasaki; compared with North Sea and Palermo materials).

*Chimaera purpurascens* (Gilbert) JORDAN and SNYDER, Smithsonian Misc. Coll., vol. 45, p. 235, 1904 (name and reference only).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, No. 3, p. 86, 1911 (part).

Depth 2 to  $2\frac{1}{2}$  to vent; head  $1\frac{7}{8}$  to  $2\frac{1}{8}$ , width  $1\frac{3}{4}$  ? to 2. Snout  $2\frac{7}{8}$  to 3 in head; eye  $2\frac{1}{2}$  to 3, subequal with snout, much greater than interorbital; mouth very slightly before front eye edge; upper dental plates with parallel vertical ridges; interorbital 5 to 6, convex. Gill opening low, apparently not extending upward beyond pectoral origin.

Skin smooth. Lateral line very finely and rather evenly waved in its course over paired fins, less so posteriorly.

Dorsal spine  $1\frac{1}{8}$  in head, with few low antrorse serrae along each hind edge terminally,  $2\frac{2}{3}$  to  $3\frac{1}{4}$  in length of soft dorsal; caudal filament  $1\frac{1}{4}$  in rest of body; anal small, low, distinct from caudal; pectoral large, reaches about opposite middle of depressed ventral, longer than head or  $1\frac{3}{5}$  in head and body to vent; ventral 3.

Brown generally, paler to grayish below. Fins all more or less dusky to blackish brown. Under surface of head and belly whitish. Iris grayish.

Japan, Korea. The following, all very poorly preserved, the muscles soft and easily falling apart, therefore the above description imperfect. All seem to belong to the present species, which not previously reported from the Philippines.

According to Dean the females reach 1,000 mm. or more, the males 850 mm. They are usually sluggish in their movements when kept in shallow water. They swim about slowly, but oftener remain in the same position, merely balancing, moving their pectorals up and down, in slow rhythm. In confinement, as when in shallow water in large floating fish baskets, they rarely live longer than the second day. At their accustomed depth, judging from their behavior when freshly caught, Dean was convinced they are normally far stronger and more alert than he had been led to believe.

6680. D. 5297. Matocot Point, S.  $50^{\circ}$  E., 5.10 miles (lat.  $13^{\circ}41'20''$  N., long.  $120^{\circ}58'$  E.). China Sea, vicinity southern Luzon. July 24, 1908. Length 292 mm.

6672. D. 5296. Matocot Point, S.  $63^{\circ}$  E., 4.50 miles (lat.  $13^{\circ}40'09''$  N., long.  $120^{\circ}57'45''$  E.). July 24, 1908. Length, 330 mm. to end of broken caudal.

10027. D. 5298. Matocot Point, S.  $38^{\circ}$  E., 6.70 miles (lat.  $13^{\circ}43'25''$  N., long.  $120^{\circ}57'40''$  E.). July 24, 1908. Length, 203 mm.

3100. D. 5516. Point Tagolo Light, Mindanao, S.  $80^{\circ}$  W., 9.7 miles (lat.  $8^{\circ}46'$  N., long.  $123^{\circ}32'30''$  E.). August 9, 1909. Length, 331 mm.

D. 5550. Jolo Light, Jolo, N.  $83^{\circ}$  E. 15.5 miles (lat.  $6^{\circ}02'00''$  N., long.  $120^{\circ}44'40''$  E.). September 17, 1909. Larva, 75 mm. long, tail long and filamentous.

## CHIMAERA JORDANI Tanaka

*Chimaera jordani* TANAKA, Journ. Coll. Sci. Tokyo, vol. 20, art. 2, p. 2, pl. 1, fig. 1, 1905 (type locality: Off Idzu, Sagami Sea); Fishes of Japan, vol. 1, pl. 10, fig. 30, 1911 (type).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Manazuru).

*Chimaera purpurascens* (not Jordan and Snyder) GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 86, 1911 (part).

Depth  $6\frac{5}{6}$  in total; head  $6\frac{9}{10}$ . Snout  $2\frac{1}{6}$  in head, obtusely convex; eye  $3\frac{3}{4}$ ,  $1\frac{2}{3}$  in snout; mouth close before eye; teeth confluent, 5 or 6 rods in each lamina above, margin sinuate and slightly convex; mandibular plates included within upper; interorbital  $4\frac{1}{2}$  to 5 in head, rather low.

Lateral line straight along side of body, almost without any sinuation.

First dorsal inserted over gill opening, spine  $6\frac{4}{5}$  in total length, with median keel and smooth anteriorly, grooved behind with terminal third with recurved spinules, fin continuous with second dorsal by low fold; second dorsal length  $2\frac{1}{4}$  in total length uniformly high; anal with hind notch separating subcaudal little behind upper notch, length  $3\frac{1}{2}$  in second dorsal length; upper caudal lobe little shorter though similar to subcaudal; pectoral  $4\frac{3}{4}$  in total, reaches little beyond ventral origin, width  $2\frac{2}{7}$  its length; ventral  $1\frac{2}{5}$  in head; clasper of male trifid, divided to  $\frac{2}{3}$  its length.

Uniformly dark brown. Length, 900 mm. (Tanaka.)

Japan.

## CHIMAERA OWSTONI Tanaka

*Chimaera owstoni* TANAKA, Journ. Coll. Sci. Tokyo, vol. 20, art. 2, p. 10, pl. 1, figs. 2-3, 1905 (type locality: Sagami Bay); Fishes of Japan, vol. 1, p. 18, pl. 5, figs. 17-18, 1911 (types).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 86, 1911 (compiled).

Depth  $6\frac{1}{10}$  in total; head  $6\frac{1}{3}$ . Snout 2 in head, obtusely convex; eye  $3\frac{4}{5}$ ,  $1\frac{4}{5}$  in snout; mouth before eye; 6 rods in front plate of upper jaw, edge of plate sinuate and slightly convex; each lower lamina with 2 concavities more or less sinuate in margin; interorbital  $4\frac{1}{4}$  in head.

Lateral line finely sinuate on body anteriorly, more pronounced behind ventrals.

Dorsal spine equals head, front surface smooth with median keel, hind edge with recurved spinules little less half its length, inserted  $\frac{2}{5}$  eye diameter behind gill opening and joined with second dorsal by low fold; second dorsal  $2\frac{1}{4}$  in total, uniformly high; anal separated from subcaudal by notch opposite hind edge of second dorsal, fin length about  $3\frac{1}{4}$  in second dorsal; subcaudal little longer and deeper than supracaudal, though little lower than second dorsal; pectoral

$4\frac{1}{2}$  in total, reaches ventral, width  $2\frac{3}{5}$  its length; ventral  $1\frac{1}{4}$  in head; male with clasper trifid, divided to terminal third.

Dark brown, with lighter dotlike and elongate spots, often indistinctly vermiculate by spots fusing. This marking extends on head and bases of paired fins. On side behind ventrals 3 pale broad lines below lateral line and 1 above. Dorsals, anal, caudal and free margins of paired fins blackish; basal parts of dorsals similar on side of body; numerous transverse series of dark dots above lateral canal on side of body. Length, 935 mm. (Tanaka.)

Japan.

Subgenus PSYCHICHTHYS Fowler

**CHIMAERA PURPURESCENS** Gilbert

*Chimaera purpurescens* GILBERT, Bull. U. S. Fish Comm., vol. 23, pt. 2 (1903), p. 582, fig. 231, 1905 (type locality: Kauai, Hawaiian Islands). (*Chimaera purpurascens* Jordan and Snyder 1904, not involved.)

*Chimaera gilberti* GARBERMAN, Mem. Mus. Comp. Zool., vol. 40, p. 90, 1911 (on Gilbert).—FOWLER, Mem. Bishop Mus., vol. 10, p. 26, 1928 (compiled).

Depth 5, body greatly compressed and very deep; head  $4\frac{1}{5}$ , width 2, sides flattened. Snout  $2\frac{1}{5}$  in head, elevated, deep, well compressed, formed as flexible flap, width at front of eyes half its length; eye 5, front edge little before middle in head length,  $2\frac{1}{5}$  in snout, greater than interorbital; mouth width  $3\frac{1}{3}$  in head, jaws massive, very broad lips finely papillose; upper dental plate with 7 rods each side median line; lower jaw with 2 very widely spaced dental points; interorbital 6, convexly elevated, constricted.

Skin largely smooth, though lower side of pharynx fully wrinkled, area extending forward to mandible.

Dorsal spine smooth and compressed,  $1\frac{2}{3}$  in head, but trifle shorter than fin; second dorsal occupies greater upper portion of tail; upper caudal lobe length  $2\frac{2}{5}$  in base of second dorsal; pectoral much longer than head or  $3\frac{3}{4}$  in entire body length, greatest width  $\frac{1}{2}$  length; ventral  $1\frac{2}{3}$  in head.

Dark drab brown, shaded darker below. Iris pale grayish. Fins all slaty.

Hawaii.

U.S.N.M. No. 51594. Kauai, Hawaiian Islands. Bureau of Fisheries. Length, 845 mm. Type.

**CHIMAERA EIDOLON** (Jordan and Hubbs)

*Psychichthys eidolon* JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 117, pl. 5, fig. 1, 1925 (type locality: off Mishima, Izu, in Sagami Bay, Japan).

*Chimaera purpurascens* (not Gilbert, 1903 [1905]) JORDAN and SNYDER, Smithsonian Misc. Coll., vol. 45, p. 235, 1904 (off Mishima, Izu in Sagami Bay).—TANAKA, Journ. Coll. Sci. Tokyo, vol. 20, p. 14, 1905.

Depth  $6\frac{1}{4}$  in total; head  $6\frac{1}{2}$ , width 2. Snout  $1\frac{7}{8}$  in head, obtusely convex; eye  $4\frac{1}{5}$ ,  $2\frac{1}{4}$  in snout; mouth before eye; front lower dental plates with 5 to 7 enamel rods, front plates of lower jaw notched at symphysis; interorbital little narrower than eye, convex.

Lateral line very slightly undulous, though not evenly waved.

First dorsal inserted nearly eye diameter behind head, spine  $1\frac{1}{4}$  in head, slender, entire, continuous with second dorsal by low fold; second dorsal length  $2\frac{1}{8}$  in total length, uniformly high; upper and lower caudals alike, latter longer or begins well before hind end of second dorsal; pectoral 5 in total,  $1\frac{1}{5}$  to ventral, width  $1\frac{4}{5}$  its length; ventral  $1\frac{2}{5}$  in head.

Uniform deep purplish black, as dark on belly as on back. Length, 1,285 mm. (Jordan and Hubbs).

Japan. Said to differ from *Chimaera purpurea* in the much higher first dorsal and shorter pectoral.

#### CHIMAERA AFFINIS Capello

*Chimaera affinis* CAPELLO, Jorn. Sci. Mat. Phys. Nat. Lisboa, vol. 1, p. 314, pl. 3, figs. 1, 1868 (type locality: Setubal, Portugal).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 350, 1870 (copied).—GOODE and BEAN, Oceanic ichthyology, pp. 31, 509, pl. 10, figs. 32–35, 1895 (off Georges Banks).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, 95, 1896 (compiled).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 91, 1911 (North Atlantic from 300–900 fathoms).

*Chimaera plumbea* GILL, Bull. Philos. Soc. Washington, vol. 2, p. 182, 1877. (type locality: "Southeast of La Have bank, in lat.  $42^{\circ}40'$  N., long.  $63^{\circ}23'$  W., at a depth of 350' fathoms").

*Chimaera abbreviata* GILL, Proc. U. S. Nat. Mus., vol. 6, p. 254, 1883 (type locality: Lat.  $40^{\circ}16'15''$  N., long.  $66^{\circ}58'$  W., in 1,290 fathoms).

Depth  $5\frac{7}{8}$  in length to end of upper caudal lobe; head  $5\frac{1}{5}$ . Snout 2 in head, acutely produced; eye about 7,  $3\frac{1}{2}$  in snout; cephalic appendage with 5 spines on inner surface; mouth below front of eye; interorbital moderately high.

Lateral line with few feeble undulations anteriorly, jugular branch meets postorbital near junction of latter and suborbital and angular branches.

First dorsal  $1\frac{2}{3}$  in head, spine with front edge rounded, fin continuous with second dorsal by low fold; second dorsal little more than half total length to hind end of upper caudal lobe, uniformly low and without emargination, its upper edge straight; upper caudal and subcaudal similarly high as second dorsal, origin of latter about opposite last fifth of second dorsal; pectoral  $4\frac{1}{4}$  in length to hind edge of upper caudal lobe, not quite reaching ventral origin, width half its length; ventral  $1\frac{3}{5}$  in head; clasper of male trifid at terminal third its length.

Uniformly plumbeous. Length, 1,246 mm. (Goode and Bean.) North Atlantic, in 300–963 fathoms.

## CHIMAERA WAITEI (Fowler)

*Hydrolagus waitei* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 419, fig. 1  
 (type locality: Victoria, Australia).

*Chimaera waitci* GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 91, 1911 (compiled).

Depth  $5\frac{2}{3}$  in total; head about 5, width  $2\frac{1}{6}$ . Snout  $1\frac{4}{5}$  in head, obtusely convex; eye  $6\frac{1}{4}$ , 3 in snout; mouth before eye, width 3 in head; above 2 small flat triangular mouth plates and below 2 trenchant strong plates; interorbital  $3\frac{3}{4}$  in head.

Lateral line straight along side of body axially; jugular section meets postorbital near junction of latter with angular and suborbital branches.

Dorsal spine slightly larger than head, front edge sharply trenchant, hind edges with about 30 serrae, apparently not connected with second dorsal; second dorsal uniformly low, length about  $2\frac{2}{3}$  in total length; supracaudal little higher than anal and about as long; no anal; pectoral reaches middle of ventral base,  $5\frac{4}{5}$  in total length, width  $1\frac{1}{5}$  its length; ventral  $2\frac{1}{8}$ , obtuse.

Uniform dull brownish.

Victoria. Apparently only known from the above described example, now dried and in poor condition.

A.N.S.P. No. 33119. Victoria, Australia. Mrs. Agnes F. Kenyon. Length, 305 mm.  
 Type.

## Subgenus HYDROLAGUS Gill

## CHIMAERA COLLIEI Lay and Bennett

*Chimaera colliei* LAY and BENNETT, Zool. Beechey's Voy., Fishes, p. 71, pl. 23, figs. 1-2, 1839 (type locality: Monterey, Calif.).—GIRARD, Rep. Pacific R. R. Surv., Fish, pt. 10, p. 360, 1858 (Puget Sound; Washington).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 689, 1865 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 350, 1870 (Esquimalt Harbor; Monterey).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 92, 1911 (California and northward).

*Chimaera colliae* JORDAN and JOUY, Proc. U. S. Nat. Mus., vol. 4, p. 16, 1881 (Monterey, California).—JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 55, 1883 (compiled).

*Chimaera collici* DEAN, Carnegie Inst. Washington, Publ. No. 32, p. 7, pls. 8-11, 1906 (Monterey, Calif.).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 28, 1930 (Far East Seas).

*Hydrolagus colliei* GILL, Proc. Acad. Nat. Sci. Philadelphia, p. 331, 1862 (reference).—COPE, Proc. Amer. Philos. Soc., vol. 13, p. 24, 1873 (Alaska).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 95, 1896 (Monterey to Alaska).—EVERMANN and GOLDSBOROUGH, Bull. Bur. Fisher., vol. 26 (1906) p. 230, fig. 4, 1907 (Alaska).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 603 (Monterey, Alaska).

*Hydrolagus colliei* GOODE and BEAN, Oceanic Ichthyol., p. 32, 1895 (compiled).

*Callorhynchus antarcticus* (not Linnaeus) GOODE and BEAN, Oceanic Ichthyol., pl. 10, fig. 36, 1895 (from Lay and Bennett).

? *Chimaera media* GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 91, 1911 (locality uncertain).

Depth  $5\frac{1}{8}$  to  $6\frac{2}{5}$  in total length; head  $4\frac{1}{5}$  to  $6\frac{1}{3}$ . Snout 2 in head, obtusely convex; eye 3 to  $3\frac{2}{3}$ ,  $1\frac{1}{5}$  to 2 in snout; mouth before eye; vomerine teeth with 5 to 7 rods; interorbital  $3\frac{4}{5}$  in head, rather low.

Lateral line straight on body, jugular section meets postorbital near junction with suborbital and angular.

Dorsal spine 1 to  $1\frac{1}{4}$  in head, interdorsal equals first dorsal base and continuous by low fold; second dorsal length  $2\frac{2}{3}$  to  $2\frac{7}{8}$  in total length, upper edge medially emarginate nearly  $\frac{3}{4}$  anterior height and posterior height little lower; upper and lower caudals lower than second dorsal, lower begins only very slightly before end of second dorsal, fin ending in slender attenuated point but usually not a filament; pectoral nearly 4 in total, width 3 in length; ventral 6, rounded; male with claspers short, not reaching ventral ends, bifid about half their length, trifid cartilages with 2 or 3 confluent by skin terminally.

Brown or gray-brown, shading whitish below. Back and sides with many variable irregular whitish spots.

North east Pacific from California to Alaska.

Garman describes *Chimaera media* on a male and female without locality, differing chiefly from the present species in the second dorsal fin divided. His specimens are 510 and 560 mm. long. Possibly they are only variants of *Chimaera colliei*.

1 example. A. N. S. P. Alaska. George Davidson.

1 example. A. N. S. P. California ? W. N. Lockington.

4 examples. A. N. S. P. Pacific Grove, Calif. Harold Heath.

#### CHIMAERA NOVAE ZEALANDIAE Fowler

*Chimaera novae zealandiae* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1910, p. 603 (on Hector).—GRIFFIN, Trans. New Zealand Inst., vol. 54, p. 246, pl. 20, fig. 2, 1923 (9 miles north of Kaipara Heads).

*Chimaera monstrosa* var. *australis* (not Shaw) HECTOR, Trans. New Zealand Inst., vol. 34, p. 239, pl. 14, fig. C, 1902 (type locality: New Zealand).

*Chimaera australis* WAITE, Rec. Canterbury Mus., vol. 1, No. 1, p. 9, 1907 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 88, 1911 (compiled).

Depth  $8\frac{1}{2}$  in total; head  $7\frac{1}{4}$ , upper profile of male convex before eye. Snout  $1\frac{7}{8}$  in head, obtusely conic; eye  $3\frac{1}{4}$ ,  $1\frac{3}{4}$  in snout; mouth before eye; tritors on dental plates rodlike; interorbital  $1\frac{1}{4}$  wide as eye. Convex. Lower gill rakers 9.

Lateral line first concave, then convex above pectoral, then along side slightly above middle by series of very short waves until below hind edge of second dorsal, when bending to lower edge of caudal axis; jugular branch meets orbital near junction of latter with angular and suborbital.

Dorsal spine  $1\frac{1}{2}$  in head, keeled on front edge and serrated behind; first dorsal ray  $1\frac{2}{5}$ , connected with second dorsal by low fold; second dorsal length  $3\frac{3}{5}$  in total length, upper edge slightly concave medially with front portion of fin slightly higher than posterior;

supracaudal very slightly shorter than subcaudal, equally high and subcaudal begins near last sixth of second dorsal, without distinct anal; caudal moderate filament; pectoral reaches hind ventral angle, about  $6\frac{1}{2}$  in total, width  $1\frac{1}{2}$  its length; ventral  $1\frac{1}{2}$  in head, obtuse; front ventral claspers retractile into shallow crescentic glandular pouches; large posterior claspers bifid, 3 times anterior claspers and about equal ventral fin, inner split along about half its length and both claspers almost wholly with short spines directed backwards.

Ground color cream, marbled with purplish brown. Double line of bluish white spots above eye from nape to base of snout. Light buff blotches and spots, various, at short intervals along margin of back. Lateral line dull white. Eye silver-white and blue-black. Horny cap on top of head cream color, streaked with brown. First dorsal spine white, base streaked with brown, rays and membranes blackish brown with broad mesial white band. Second dorsal with small dark patch on front rays, thence broadly margined black, bases of rays much lighter. Caudal rays uniform blackish brown, filament white. Paired fins brownish gray. Length, 773 mm., filament 210 mm. (Griffin.)

New Zealand.

Subgenus *BATHYALOPEX* Collett

*CHIMAERA MITSUKURII* Dean

*Chimaera mitsukurii* DEAN, Journ. Coll. Sci. Tokyo, vol. 19, art. 3, p. 6, pl. 1, figs. 1-2, 1904 (type locality: Misaki, Sagami).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 27, p. 234, fig. 2, 1904 (Sagami Bay).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 87, 1911 (Sagami Bay).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 186, 1920 (Misaki).

*Phasmichthys mitsukurii* JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 119, 1925 (Misaki).

*Chimaera phantasma* (not Jordan and Snyder) JORDAN and FOWLER, Proc. U. S. Nat. Mus., vol. 26, p. 669, 1903 (Sagami Bay).

Depth  $9\frac{1}{2}$  in total length; head  $8\frac{1}{3}$ . Snout  $2\frac{1}{5}$  in head, obtusely convex; eye  $3\frac{1}{4}$ ,  $1\frac{1}{2}$  in snout; mouth below front of eye; upper front dental plate with about 8 tritors, hind plate with 3 well-marked on inner face and most lateral narrowest; lower dental plate with a single tritor projecting sharply from its inner surface, narrow; interorbital low.

Lateral line somewhat irregular, not waved; jugular section meets angular short space below junction of orbital and angular.

Dorsal spine long as head, inserted over hind edge of gill opening, front and hind edges serrated, connected with second dorsal by low fold; second dorsal length  $2\frac{1}{2}$  in total, upper edge slightly concave little before middle; subcaudal little deeper than supracaudal, apparently twice as long as supracaudal with its origin opposite middle

of second dorsal, anal not distinct; caudal filament slightly over twice in rest of body; pectoral  $6\frac{1}{8}$ , reaches middle of ventral base, width  $1\frac{3}{4}$  its length; ventral  $1\frac{1}{4}$  in head, rather obtusely pointed.

Blackish above, with here and there clouded light areas, below dark sepia. Vertical fins nearly black, somewhat paler basally. Bluish tint on front rim of ventral. Length, 600 mm. (Dean.)

Japan.

**CHIMAERA BARBOURI Garman**

*Chimaera barbouri* GARMAN, Bull. Mus. Comp. Zool., vol. 51, No. 9, p. 255, 1908 (type locality: Aomori, Japan).—TANAKA, Fishes of Japan, vol. 1, p. 16, pl. 4, fig. 14, pl. 5, fig. 19, 1911.—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 88, 1911 (Aomori; off Otsu).—TANAKA, Jap. Fish. Life Colours, No. 38, 1933.

*Bathyhalopex barbouri* JORDAN and HUEBS, Mem. Carnegie Mus., vol. 10, p. 118, 1925 (reference).

*Chimaera spilota* TANAKA, Journ. College Sci. Tokyo, vol. 23, p. 15, 1908 (type locality: Off Miyako, Rikuchu; Ishinomaki, Rikuzen).

Head little over 5 in length to end of second dorsal,  $2\frac{1}{2}$ . Eye  $3\frac{1}{2}$  in head.

Lateral line irregular, not in short waves; jugular branch meets postorbital near junction of latter with suborbital and angular.

Dorsal spine  $1\frac{1}{2}$  in head; dorsals united by low fold, interdorsal shorter than base of first dorsal; second dorsal  $2\frac{1}{2}$  times head length, depth equals orbital length and depth in mid-length half as much, border rising posteriorly to nearly anterior height; upper caudal slightly deeper than longer subcaudal, caudal a filament; pectorals large, reach ventrals, hind edges slightly concave; male with short, stout claspers trifid, more than half their length, each of 3 branches somewhat similarly expanded terminally.

Blackish, with white spots on flanks. (Garman.)

**CHIMAERA AFRICANA Gilchrist**

*Chimaera africana* GILCHRIST, Marine Biolog. Surv. South Africa, Spec. Rep. No. 2, p. 51, pl. 8, 1922 (type locality: Natal coast in 324 fathoms).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 95, 1925 (copied).—NORMAN, Discovery Rep., vol. 12, p. 47, 1935 (South Africa).

Depth  $10\frac{2}{3}$  in total; head  $8\frac{3}{4}$ . Snout  $2\frac{1}{4}$  in head, ends in rather robust convexity; eye 3,  $1\frac{1}{4}$  in snout; mouth before front of eye; upper dental plate sharp, 5 columns on each side of jaw, with projecting irregular margin; lower dental plate similar, wider, on each side of more numerous teeth, ill defined forms continuous cutting edge deeply incised; interorbital rather low.

Lateral line straight. Cephalic appendage with 6 short spines.

First dorsal spine  $6\frac{3}{4}$  in total length, variable, anteriorly with thin ridge bluntly serrated from base to  $\frac{3}{4}$  its length, on hind side of groove bordered each side by sharp ridge or keel with low retrorse

spines from point where joining soft rays to tip; second dorsal continuous with first by low membrane, separated from caudal by notch, second dorsal length  $3\frac{1}{8}$  in total length, uniformly high; upper caudal and subcaudal similar, both little lower than second dorsal, origin of subcaudal about last fifth of second dorsal; pectoral  $5\frac{1}{4}$  in total, reaches ventral, width  $2\frac{2}{5}$  its length; ventral  $8\frac{7}{8}$ , front and hind claspers well developed, each of latter ending in rounded knob with small terminal papillae, divisions of hind claspers  $\frac{1}{3}$  their length.

Body dark brown, fins purplish black. Length not given. (Gillchrist.)

Natal coast.

**CHIMAERA DEANI** H. M. Smith and Radcliffe

*Chimaera deani* (H. M. Smith and Radcliffe) H. M. SMITH, Proc. U. S. Nat. Mus., vol. 42, p. 232, pl. 29, 1912 (type locality: lat.  $13^{\circ}45'15''$  N., long.  $120^{\circ}46'30''$  E., off Sombrero Island, west coast of Luzon, in 236 fathoms). *Chimaera dacni* ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 17, 1937 (reference).

Depth  $5\frac{1}{3}$  to supracaudal origin; head  $4\frac{1}{2}$ . Snout  $2\frac{1}{3}$  in head, obtuse, profiles alike; eye  $2\frac{1}{3}$ , elevated, subequal with snout; mouth opposite front eye edge, hind angle of jaws opposite hind pupil edge, or its length  $3\frac{1}{5}$  in head; interorbital moderate, forms slight convexity in upper profile of head above front of eye.

Lateral line axial and continuous, deflected little behind supracaudal origin; with continuous forward loop around eye on side of head.

Dorsal spine inserted close behind gill opening, long as head, feebly and sparsely serrated on upper or terminal half, fin height  $3\frac{4}{5}$  in fish to supracaudal origin; interdorsal notch very narrow; second dorsal height anteriorly  $3\frac{1}{10}$  in head, twice its height posteriorly; supracaudal height 8 in head; caudal filament elongated, slender, little longer than space between snout tip and supracaudal origin; no anal; pectoral  $2\frac{5}{6}$ , width 2 in its length, hind edge convex; ventral  $1\frac{1}{10}$  in head, hind edge little concave.

Uniform blackish brown.

Philippines.

This species differs from *Chimaera mirabilis* in the smaller eye, higher first dorsal with longer and more slender spine, more elevated second dorsal, less extensive subcaudal, longer pectoral, and different coloration.

U. S. N. M. No. 72284. Lat.  $13^{\circ}45'15''$  N., long.  $120^{\circ}46'30''$  E., off Sombrero Island, west coast of Luzon, in 236 fathoms. *Albatross* Expedition. Length, 19.5 cm. from snout tip to supracaudal origin, 23.5 cm. from supracaudal origin to end of caudal filament. Type.

## CHIMAERA MIRABILIS Collett

*Chimaera (Bathylophex) mirabilis* COLLETT, Forh. Vid. Selskr. Christiania, No. 9, p. 5, 1904 (type locality: Faroe Bank in 750-1,200 meters); Rep. Norwegian Fish. Marine Investigation, vol. 2, p. 35, pl. 1, fig. 4, 1905 (Faroe Channel; Faroe Bank).

*Chimaera mirabilis* GARMAN, Mem. Mus. Comp. Zool., vol. 40, No. 3, p. 89, 1911 (Faroe Channel, 750-1,200 meters).

Depth  $9\frac{1}{8}$  in total length; head  $8\frac{1}{8}$ . Snout 2 in head, obtusely convex; eye 2, equals snout; interorbital low, forehead obtusely convex over front of eye.

Lateral line bends in short upper loop close behind junction with ocular and orbital branches; jugular branch meets angular below eye and short space below junction of angular with orbital and suborbital branches; on body lateral line straight.

Dorsal spine long as dorsal base or  $1\frac{1}{2}$  in head, reaches second dorsal origin and continuous with second dorsal by low fold; second dorsal length  $3\frac{3}{5}$  in total length, little higher anteriorly than posteriorly and depressed medially; supracaudal  $1\frac{4}{5}$  subcaudal length, which begins little before last third in second dorsal base and without anal division; caudal ends in long filament about eye diameter longer than rest of body; pectoral  $6\frac{2}{5}$  in total, reaches little beyond ventral base, width  $1\frac{1}{2}$  its length; ventral  $1\frac{2}{5}$  in head, convex behind.

Gray brown, fins darker. Length, 450 mm. (Collett.)

Faroe Bank.

## CHIMAERA OGILBYI Waite

*Chimaera ogilbyi* WAITE, Prelim. Rep. *Thetis*, p. 41, pl. 11, 1898 (type locality: New South Wales); Mem. Australian Mus., vol. 4, p. 48, pl. 6, 1899 (off Port Hacking, New South Wales).—TANAKA, Journ. College Sci. Tokyo, vol. 23, art. 7, p. 10, 1908 (Suruga Bay; Kagoshima).—STEAD, Fishes of Australia, p. 233, 1908.—MCCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 5, 1911 (Bass Strait).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, No. 3, p. 90, 1911 (compiled).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 13, pl. 2, fig. 44a, 1927.

Depth  $6\frac{3}{4}$  in total length; head  $5\frac{1}{4}$ . Snout  $1\frac{2}{3}$  in head, obtusely conic; eye 5,  $3\frac{1}{8}$  in snout; mouth before eye; front upper dental plates with sinuous margin and each formed of 6 to 8 enamel rods, palatine pair with outer edges roughly denticular and flat surfaces each with 3 tubercles white and enamel-like; lower dental plates with margin incised by 3 deep clefts, 1 median and 2 lateral, forming 4 rounded prominences and long white enamel elevation backward from behind each of outer or posterior cusps; interorbital low.

Lateral line with even short waves over greater portion anteriorly on body; jugular section meets orbital section close to junction of orbital with angular and suborbital sections.

Dorsal spine  $1\frac{1}{4}$  in head, front and hind edges terminally serrated; first dorsal ray  $1\frac{1}{6}$  (fin apparently separate from second dorsal); second dorsal uniformly low, length  $2\frac{2}{5}$  in total length; supracaudal little shorter than subcaudal which begins slightly before supracaudal but without notch to indicate anal; pectoral reaches middle of ventral,  $4\frac{1}{8}$  in total length, width 2 in its length; ventral  $1\frac{2}{3}$  in head, pointed.

Silvery above and on sides, yellowish below. Snout tip black. Eye yellow. Lateral line raised, brown. Markings formed as narrow bands passing obliquely from behind forward and downward, confined to head and front part of body and formed of brown splashes which below become rings, also extend across chin and pectoral bases. Above lateral line whole body marked with 25 narrow transverse broken lines, oblique on tail. Fin membranes bluish black, bases of paired fins horn color. Caudal filament yellow. Length, 860 mm. (caudal filament incomplete). (Waite.)

Bass Strait, New South Wales.

**CHIMAERA TSENGI Fang and Wang**

*Chimaera tsengi* FANG and WANG, Contr. Biol. Lab. Sci. Soc. China, vol. 8, p. 281, fig. 29, 1932 (type locality: Chefoo; Chinhai; Chekiang).

Depth  $1\frac{1}{5}$  in head length; head greater than 5 in length to supracaudal origin, width 2 in its length. Snout  $2\frac{1}{3}$  in head, soft and triangular in anterior profile, without rostral appendage; eye  $4\frac{1}{3}$ ,  $1\frac{3}{4}$  in snout, greater than interorbital; mouth small, inferior; teeth 2 in each jaw, upper with 10 laminae forming serrated cutting edge, anterior one pointed, posterior very short, broad and its hind edge more or less roughened; laminae of lower jaw 8 each side, forming broadly concave cutting edge; vomerine tritors 1 anterior and 2 posterior on each side which much elongated, 1 tritor in inner wall of lower teeth; nostrils large, close together, short space before mouth. Gill opening small, before pectoral base.

Lateral line wavy anteriorly, less so below front part of second dorsal and straight posteriorly; an upward curve below supracaudal origin and posteriorly along subcaudal base.

First dorsal spine  $1\frac{1}{4}$  in head, compressed, pointed, straight, front edge smooth and keeled, hind edge serrated, especially its tip and with shallow groove, when depressed nearly reaches second dorsal origin; second dorsal very long, uniform, joined to first dorsal by very low rayless fold of skin and separated from supracaudal by deep notch. Anal confluent with subcaudal. Caudal with very short filament; supracaudal much lower than second dorsal and shorter than subcaudal. Pectoral  $1\frac{1}{4}$  times head, width  $1\frac{1}{4}$  times its length, with thick muscular base, when depressed reaches far posterior to ventral base.

Color in formalin light brown above, paler below. Back with broad and longitudinal dark streak along base of dorsals to caudal, 2 shorter and more obscure streaks, 1 above lateral line and 1 below, on anterior part of body. Lateral line dusky. Top of head darker, lighter band across snout in front of eye. Fins blackish toward tips.

Length, 750 mm. (Fang and Wang.)

China. Differs from *Chimaera monstrosa* and allied species chiefly in the confluent anal and subcaudal fins.

### Order CALLORHINCHOIDEI

Snout produced, more or less as proboscis. Claspers simple.

### Family RHINOCHIMAERIDAE

Body elongate, tapering into very long tail, tip filamentous. Head with long rostral proboscis, pointed, with cartilaginous midrib and foliaceous lateral skin expansions at base. Gill openings separated by wide isthmus. Notochord with rings. Cerebral hemispheres distant from both olfactory and optic lobes. Lateral canal system subtubular. Dorsals 2, first with great, erectile, triangular spine, lateral edges serrate, close to head; second dorsal low. Anal not distinct from subcaudal. Caudal tapers backward to filament. Subcaudal well developed, without produced lobe. Pectorals large, free. Males with small, simple claspers, slender, end in volute knob with hooked spines. Males with frontal holder or tenaculum and prepelvic tenacula.

Bathypelagic.

#### ANALYSIS OF GENERA

*a<sup>1</sup>*. Snout compressed; upper caudal edge spinose----- *Rhinochimaera*  
*a<sup>2</sup>*. Snout depressed; upper caudal edge not spinose----- *Harriotta*

#### Genus RHINOCHIMAERA Garman

*Rhinochimacra* GARMAN, Proc. New England Zool. Club, vol. 2, p. 76, 1901. (Type, *Harriotta pacifica* Mitsukuri.)

Snout depressed, elongated into slender point, profile of forehead nearly straight. Teeth without tritors or dental plates, much like horny covers of jaws of tortoises or birds. Supracaudal low, upper edge armed with spines. Male with peduncle of frontal tenaculum short and straight, owing to straight upper profile of head.

#### RHINOCHIMAERA PACIFICA (Mitsukuri)

*Harriotta pacifica* MITSUKURI, Zool. Mag., Tokyo, vol. 7, p. 97, pl. 16, 1895  
 (type locality: Kurihama, near Misaki, Sagami Sea).—JORDAN and SNYDER,  
 Annot. Zool. Japon., vol. 3, p. 43, 1901 (Sagami Bay?).—DEAN, Jour. Coll.  
 Sci. Tokyo, vol. 19, art. 4, pls. 1-2, 1904.

*Rhinochimaera pacifica* GARMAN, Proc. New England Zool. Club, vol. 2, p. 75, 1901 (reference); Bull. Mus. Comp. Zool., vol. 41, p. 247, pls. 1-2, figs. 1-2, pl. 3, figs. 1, 4-5, pl. 4, figs. 2-4, pl. 5, figs. 1-2, pls. 8-9, pl. 12, pls. 14-15 (anatomy), 1904; Mem. Mus. Comp. Zool., vol. 40, p. 94, 1911 (Japan).—H. M. SMITH, Proc. U. S. Nat. Mus., vol. 42, p. 232, 1912 (egg-capsule from lat.  $3^{\circ}17'40''$  S., long.  $120^{\circ}36'45''$  E.).

*Rhinochimaera (Harriotta) pacifica* DEAN, Journ. Coll. Sci. Tokyo, vol. 19, art. 4, p. 1, 1904 (Misaki).

Depth  $9\frac{1}{3}$  in total; head  $3\frac{2}{3}$ , width 4. Snout  $1\frac{1}{4}$  in head; eye  $10\frac{1}{3}$ , 8 in snout, subequal with interorbital,  $2\frac{3}{4}$  to end of front of upper jaw; jaws fall little before last fourth in snout length; interorbital convexly elevated.

Dermal denticles of male on frontal and 2 ventral pairs of claspers; in female only on dorsal rim of supracaudal. Lateral line nearly straight along side.

First dorsal begins eye diameter behind gill opening, spine  $3\frac{1}{16}$  in total head length, hind lateral edges for terminal third with minute irregular denticles, fin continuous with second dorsal by low fold; second dorsal low, gradually little higher behind middle, length  $4\frac{1}{16}$  in total; supracaudal low fold, little distinct, subcaudal deep as second dorsal also as long; tail ends in slender filamentous point; pectoral 6 in total, reaches about  $\frac{7}{8}$  to ventral, width  $3\frac{1}{3}$  its length; ventral  $2\frac{2}{3}$ , pointed; long slender claspers little shorter than ventral line, ends small and globular.

Plumbeous, paler below. Muzzle white, which color extends forward along sides and ventral margin of greatly produced snout. Dorsals margined with dusky band and paired fins darkest along front margins. Mature females over 1,300 mm., males 900 mm. (Dean.)

Japan.

#### Genus HARRIOTTA Goode and Bean

*Harriotta* GOODE and BEAN, Proc. U. S. Nat. Mus., vol. 17, p. 471, 1895. (Type, *Harriotta raleighana* Goode and Bean, monotypic.)—(Goode and Bean) GOODE, Proc. Biol. Soc. Washington, vol. 3, p. 104, 1886 (generic name only). *Anteliochimaera* TANAKA, Journ. College Sci. Tokyo, vol. 27, p. 27, 1909. (Type, *Anteliochimaera chaetirhamphus* Tanaka, monotypic.)

Snout elongate, depressed, somewhat flattened, forehead curving down before snout. Teeth with tritors, notches, or sinuations on cutting edges. Supracaudal moderately high, upper edge without spines. Frontal tenaculum of male with elongate, much-curved stem to comport with downward curve of forehead.

#### HARRIOTTA RALEIGHANA Goode and Bean

*Harriotta raleighana* GOODE and BEAN, Proc. U. S. Nat. Mus., vol. 17, p. 472, pl. 19, 1895 (type locality: Gulf Stream in lat.  $36^{\circ}-39^{\circ}$  N., long.  $70^{\circ}-74^{\circ}$  W., in 707-1,081 fathoms); Oceanic ichthyology, p. 33, pl. 11, figs. 37-40, 1895 (Gulf Stream).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1,

p. 96, 1896 (compiled); pt. 4, pl. 19, fig. 4, 1900 (copied).—GARMAN, Bull. Mus. Comp. Zool., vol. 41, p. 263, pl. 2, figs. 3-5 (head), pl. 4, fig. 1 (skin), pl. 5, figs. 3-9 (dentition), 1904 (types).—DEAN, Carnegie Inst. Washington Publ., No. 32, p. 6, 1906 (reference).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 37, p. 662, pl. 38, 1910 (North Atlantic).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 95, 1911 (Western Atlantic, in 707-1,080 fathoms).

*Rhinochimaera atlantica* HOLT and BYRNE, Ann. Mag. Nat. Hist., ser. 8, vol. 3, p. 279, 1909 (type locality: Lat. 50°31' N., long. 11°31' W., 670-770 fathoms, Irish Atlantic slope).

*Harriotta atlantica* GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 96, 1911 (copied).

*Anteliochimaera chaetirhamphus* TANAKA, Journ. College Sci. Tokyo, vol. 27, p. 7, pl. 1, 1909 (type locality: Sagami Sea); Fishes of Japan, vol. 1, p. 10, pl. 3, fig. 11, pl. 4, figs. 15-16, 1911.

*Harriotta chaetirhamphus* BEAN and WEED, Proc. U. S. Nat. Mus., vol. 37, p. 662, pl. 39, 1910 (North Pacific, Japan).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, No. 3, p. 95, 1911 (Okinose, Sagami Sea, in 400 fathoms).

Depth  $4\frac{2}{3}$  to  $7\frac{1}{8}$  in total; head 4 to  $4\frac{1}{2}$ , width  $1\frac{9}{10}$  to  $2\frac{1}{5}$ . Snout  $1\frac{1}{3}$  to  $1\frac{1}{2}$  in head; eye  $6\frac{1}{4}$  to  $9\frac{1}{4}$ ,  $4\frac{3}{5}$  to  $6\frac{1}{5}$  in snout,  $2\frac{1}{3}$  to 3 in interorbital; preoral length  $1\frac{1}{2}$  in head; mouth rather close before eye; interorbital  $2\frac{4}{5}$ , convex.

Lateral line nearly straight along side of body axially; jugular section meets orbital behind junction of orbital with suborbital and angular branches.

Dorsal spine  $1\frac{2}{3}$  to  $2\frac{3}{5}$  in head, hind edges finely serrated, interdorsal space nearly equals eye; second dorsal uniformly low, about 5 in total length; supracaudal shorter than subcaudal, which longer than supracaudal in young; no anal; tail ends in rather short filament with age, less than subcaudal length; pectoral  $3\frac{3}{4}$  in total in young to  $6\frac{1}{2}$  with age, reaches ventral in adult though much shorter with young, width half its length; ventral  $1\frac{3}{5}$  to  $2\frac{3}{4}$  in head, pointed.

Uniform brown, caudal filament paler.

Japan. Also in the Atlantic.

#### HARRIOTTA PINNATA Schnakenbeck

*Harriotta pinnata* SCHNAKENBECK, Mitt. Zool. Mus. Hamburg, vol. 44, p. 40, figs. 6-9, 1931 (type locality: Walvis Bay, Southwest Africa).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 2, p. 1158, fig. 488, 1936 (copied).—BARNARD, Ann. South African Mus., vol. 32, pt. 2, p. 46, 1937 (reference).

If really different from *Harriotta raleighana* this species seems to be distinguished chiefly by the presence of a small well-marked anal lobe below the hind end of the low dorsal. Described from a male 100 cm. and a female 108 cm. long.

#### Family CALLORHINCHIDAE

Body compressed, tapers backward and becomes slender in tail. Head short, pointed. Snout with flexible proboscis ending in retrose leaflike terminal end. Teeth with tritors receiving impact on sides

instead of edges. Tritors of palatines in mandibulars on sides of laminæ. Notochord without rings. Cerebral hemispheres nearer optic lobes than to olfactories, connections slender. Lateral line tubular. First dorsal advances near occiput, short, with strong erectile spine; second dorsal short; anal farther back than dorsal, distinct from subcaudal. Caudal axis slightly elevated from body. Pectorals large, free, male with simple, slender claspers, appear as if rolled into tube joined near end. Male with frontal tenaculum and 2 prepelvic tenacula.

### Genus CALLORHINCHUS Lacépède

*Callorynchus* GRONOW, Zoophylacii, p. 31, 1763 (species nonbinomial). (Type, *Chimacra callorynchus* Linnaeus, monotypic; Cuvier, Règne animal, vol. 2, ed. 1, p. 140, 1817.)

*Callorhinchus* LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 400, 1798. (Type, *Chimacra callorynchus* Linnaeus.)

*Callorhincus* DUMÉRIL, Zool. Analytique, p. (104) 333, 1806. (Type, *Chimacra callorynchus* Linnaeus.)

*Callorhynchos* FLEMING, Philos. Zool., vol. 2, p. 380, 1822. (Type, *Chimacra callorynchus* Linnaeus.)

*Callorhynchus* CUVIER, Règne animal, vol. 2, ed. 2, p. 382, 1829. (Type, *Chimacra callorynchus* Linnaeus.)

*Callorinchus* GRIFFITH and SMITH, Animal Kingd. Cuvier, Griffith's, vol. 10, p. 97, 1834. (Type, *Chimacra callorynchus* Linnaeus.)

*Callirhynchus* AGASSIZ, Nomencl. Zool. Index, pp. 56, 60, 1846. (Type, *Chimacra callorynchus* Linnaeus.)

Body and head somewhat deeper than wide. Vomerine teeth without rods. Mandibular and palatine dental plates with 1 or 2 tritors each; in some young tritors longitudinal parallel bars on side of lamina, sometimes persistent. Frontal tenaculum of male with wide stem and broad articulation. Caudal with more or less produced subcaudal lobe. Caudal filament moderate to short or absent.

### ANALYSIS OF SPECIES

a<sup>1</sup>. Pectorals reach ventrals.

b<sup>1</sup>. Dorsal origin forward of ends of pectoral bases; pectorals nearly reach mid-bases of ventrals; tritors with long, slender, pointed prongs, subequal.

*capensis*

b<sup>2</sup>. Dorsal origin little behind pectoral origin; pectorals reach beyond mid-bases of ventrals; tritors with thick, unequal prongs, outer shorter.

*callorynchus*

b<sup>3</sup>. Dorsal origin somewhat before pectoral bases; pectorals nearly or quite reach ventral bases; tritors with short, thick prongs, outer very short.

*milii*

a<sup>2</sup>. Pectorals not reaching ventrals; tritors 2 on each palatine tooth, not fused with age, strong, longitudinally parallel bars----- *smythii*

## CALLORHINCHUS CAPENSIS Duméril

*Callorhynchus capensis* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 695, pl. 13, figs. 5-5a, 1865 (type locality: Cape of Good Hope).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 99, 1911 (Cape of Good Hope).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 2, p. 1159, fig. 489, 1936 (compiled).

*Callorhynchus capensis* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (Cape of Good Hope).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 96, 1925 (west coast from Walfish Bay south to Agulhas Bay, to 50 fathoms).

*Callorhynchus antarcticus* (not Lay and Bennett) BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 21, p. (50, 57) 78, 1860 (Cape of Good Hope).—DUMÉRIL, Hist. Nat. Poiss., Elasmobr., vol. 1, p. 693, pl. 13 (head), 1865 (Cape of Good Hope).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (Cape of Good Hope).—REGAN, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Bird Island).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 290, 1917 (references).

Depth  $5\frac{1}{2}$  to subcaudal origin; head  $3\frac{1}{2}$ . Snout  $1\frac{2}{3}$  in head; eye  $5\frac{2}{3}$ ,  $3\frac{3}{5}$  in snout; palatine plate with 2 narrow longitudinal tritors, mandibular plate with slightly broader median tritor which anteriorly acute; interorbital low.

Lateral line rather uniformly irregular, waves moderate and similar.

Dorsal spine inserted nearly eye diameter before pectoral origin,  $1\frac{1}{2}$  in head, front and hind edges serrated; second dorsal inserted above hind part of ventral base, front fin edge  $2\frac{1}{4}$  in head, or  $2\frac{1}{4}$  in its base; anal begins before hind dorsal end, length  $2\frac{1}{10}$  in head; caudal  $2\frac{2}{5}$  in rest of body, front subcaudal edge 4 in head; ventral 2; pectoral reaches about  $\frac{1}{4}$  in ventral,  $2\frac{3}{4}$  in length to subcaudal origin, width  $3\frac{1}{4}$  its length.

Silvery, back and fins dark brown. Dorsal spine, dental plates and hooks on tenacula greenish. Pupil emerald green, iris like body. Female to 960 mm., male 740 mm. (Barnard.)

South Africa, to 50 fathoms.

## CALLORHINCHUS CALLORYNCHUS (Linnaeus)

*Chimaera callorynchus* LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 236, 1758 (type locality: "In Mari Aethiopico"); ed. 12, vol. 1, p. 402, 1766 (copied).—BONNATERRE, Tableau encyclop. Ichth., p. 14, 1788 (Chile).—WALBAUM, Artes di Pisc., vol. 3, p. 589, 1792 (copied).

*Chimaera callorhynchus* GMELIN, Syst. Nat. Linn., vol. 1, p. 1489, 1789 (Aethiopian Sea; Chile; not New Holland).—SCHNEIDER, Syst. Ichth. Bloch, p. 350, 1801 (Mari Aethiopico; Chile).

*Chimaera callorhinchus* LACÉPÈDE, Hist. Nat. Poiss., vol. 1, p. 401, pl. 12, fig. 2, 1798 (Chile; not New Holland).

*Callorhynchus callorynchus* MENSCH, Mus. Gronow, p. 19, 1778 (reference).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 98, 1911 (off southern South America).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1926, p. 277 (Chile).

*Callorhynchus callorhynchus* BERG, Ann. Mus. Buenos Aires, vol. 4, p. 18, 1895 (Santa Cruz, Mar del Plata, Montevideo, Rio de la Plata).—EVERMANN and KENDALL, Proc. U. S. Nat. Mus., vol. 31, p. 73, 1906 (Argentina).—EVERMANN and RADCLIFFE, U. S. Nat. Mus. Bull. 95, p. 18, 1917 (La Ventanilla, Peru).—NORMAN, Discovery Rep., vol. 16, p. 35, figs. 12, 13, 1937.

*Chimaera australis* SHAW, General zoology, vol. 5, p. 368, pls. 157 (upper fig.) and 158, 1804 (type locality: southern seas).

*Callorynchus elephanticus* BORY, Dict. Class. Hist. Nat., vol. 3, p. 61, 1823 (type locality: Chile).

*Callorhynchus elephanticus* GISTEL, Naturg. Thierreichs, p. 103, 1848 (Chile).

*Callorhynchus antarcticus* LAY and BENNETT, Zool. Beechey's Voy., Fishes, p. 75, 1839 (no type locality).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (Chiloe); Proc. Zool. Soc. London, 1881, p. 19.—SMITT, Bihang Svenska Vet. Akad. Handl., vol. 24, p. 66, pl. 6, fig. 43a, 1899 (Bay of Puerto Madryn, Tierra del Fuego).—GARMAN, Bull. Mus. Comp. Zool., vol. 41, pl. 7, figs. 7–9, pl. 10, 1904.

*Callorhynchus peronii* DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 694, pl. 14, figs. 4–4a (spines), 1865 (type locality: "Péron de son voyage aux terres australes; Valparaiso").

*Callorhynchus argenteus* PHILLipi, Anal. Mus. Nac. Chile, sec. 1, p. 11, pl. 5, fig. 1, 1892 (type locality: Chile).

Depth 5 to subcaudal origin; head 3. Snout  $1\frac{1}{2}$  in head, frontal flap as seen above elongately triangular, with broad short stem; eye  $6\frac{3}{4}$ , about  $4\frac{2}{5}$  in snout; (each palatine plate of adult with single tritor, fused portion massive and broadly rounded, prongs in front rather short and thick, especially outer one—Garman); interorbital low.

Lateral lines irregularly sinuous, not evenly waved; small asperities in rows in interorbital on cheek and along back before and behind second dorsal.

Dorsal spine  $1\frac{1}{4}$  in head, origin about opposite pectoral origin, front edge with fine serrae medially and hind edge with larger antrorse serrae terminally; front edge of second dorsal  $2\frac{1}{4}$  in head,  $1\frac{1}{2}$  in its base, origin behind ventral origin; anal begins behind end of second dorsal, length 2 in head; caudal nearly 2 in rest of body, front subcaudal edge 3 in head; ventral  $1\frac{1}{8}$ ; pectoral  $2\frac{3}{4}$  to subcaudal origin, reaches middle of depressed ventral, width  $2\frac{1}{4}$  its length.

Silvery with blotches of dull bluish over the back. Borders and ends of fins blackish. Male 337 mm., female 343 mm. (Smitt.)

Off Chile and Argentina.

#### CALLORHINCHUS MILII Bory

*Callorhynchus milii* BORY, Dict. Class. Hist. Nat., vol. 3, p. 62, pl. 5, 1823 (type locality: Western coasts of New Holland).—GARMAN, Mem. Mus. Comp. Zool., vol. 40, p. 100, 1911 (Australia, Tasmania, New Zealand).

*Callorhynchus milii* GARMAN, Bull. Mus. Comp. Zool., vol. 41, p. 267 (Hobart-town), pl. 6, figs. 7–8 (teeth), pl. 15, figs. 4–5 (brain), 1904.—WAITE, Rec. South Australian Mus., vol. 2, p. 35, fig. 49, 1921.

*Callorhynchus millii* McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 130, 1925 (Günther's Port Denison record said incorrect).

*Callorhynchus tasmaniensis* RICHARDSON, Proc. Zool. Soc. London, vol. 7, p. 29, 1840 (type locality: Murderers Bay, Tasmania, Jan. 16, 1770, Solander); Trans. Zool. Soc. London, vol. 3, p. 174, 1841 (Tasmania).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 696, 1865.

*Callorhynchus australis* (not Shaw 1804) HOBSON, Tasmania Journ. Sci. Agr. Stat., vol. 1, p. 14, 1842.

*Callorhynchus antarctica* (not Lay and Bennett) GRAY, List Fish British Museum, vol. 1, p. 22, 1851 (Australia).—HECTOR, Trans. New Zealand Inst., Wellington, vol. 34, p. 239, pl. 14, figs. A-B, 1902.

*Callorhynchus antarcticus* GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (Australia; Kangaroo Island; Port Denison; New Zealand).—HECTOR, Colonial Mus. Gov. Surv. Dept. (Fishes New Zealand), p. 74, 1872.—CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 214, 1872 (Cape of Good Hope, Victoria, Portland, Tasmania).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 5, p. 285, 1880 (Australia; Tasmania); vol. 6, p. 349, 1881 (coasts of Australia and Tasmania).—MCCOY, Prodromus Zool. Victoria, dec. 12, pl. 112, 1886.—OGILBY, Cat. Fishes Australian Mus., pt. 1, p. 24, 1888 (Bass Straits; Tasmania; Hobart).

*Callirhynchus dasycaudatus* COLENZO, Trans. New Zealand Inst., vol. 11, p. 298, pl. 17, fig. 1, 1879 (type locality: Poverty Bay).

*Callorhynchus callorhynchus* (not Linnaeus) WAITE, Rec. Canterbury Mus., vol. 1, No. 2, p. 23, pl. 16, fig. 2, 1909 (east coast South Island to Cook Strait, in 9–102 fathoms).—MCCULLOCH, Zool. Res. Endeavour, vol. 1, p. 16, 1911 (Bass Straits and Victorian coast).

Depth  $3\frac{1}{2}$  to vent; head 2, width 3. Snout  $1\frac{3}{5}$  in head, lower flap of rostrum  $1\frac{1}{2}$  its length; eye  $5\frac{1}{2}$  in head,  $3\frac{1}{2}$  in snout,  $1\frac{1}{3}$  in interorbital; mouth width 6 in head; edges of teeth in both jaws straight and nearly even; interorbital  $4\frac{1}{2}$ , broadly convex. Gill opening  $5\frac{3}{4}$ .

Skin smooth. Lateral line continuous to end of caudal; extends forward and parallel with hind and lower eye edges, giving branch toward pectoral and 3 anterior radiating on cheek; upper branch connects its fellow at supraoccipital and sends branch forward to end of snout.

Dorsal spine  $1\frac{1}{3}$  in head,  $1\frac{1}{4}$  in pectoral length, which 2 in combined head and trunk length to vent; ventral length 4.

Silvery gray, little darker on head above and on back. Iris grayish. Fins all more or less brownish, first dorsal soft portion more deep or dark gray brown terminally.

Tasmania, Victoria, New Zealand.

U.S.N.M. No. 39697. New Zealand. Otago University. Length, 270 mm.

#### CALLORHINCHUS SMYTHII Lay and Bennett

*Callorhynchus smythii* LAY and BENNETT, Zool. Beechey's Voy., Fishes, p. 75, pl. 22, fig. 3, 1839 (type locality: Pacific Ocean, La Concepcion, South America).—DUMÉRIL, Hist. Nat. Elasmobr., vol. 1, p. 697, 1865 (copied).

*Callorhynchus smythii* GARMAN, Bull. Mus. Comp. Zool., vol. 41, p. 271, pl. 6, figs. 1–4, 1904; Mem. Mus. Comp. Zool., vol. 40, p. 98, 1911 (Chile; Peru).

*Callorhynchus callorhynchus* (not Linnaeus) CUVIER, Règne animal, vol. 2, p. 140, 1817.

*Callorhynchus antarcticus* (not Linnaeus) GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 351, 1870 (part).—VAILLANT, Mission Sci. Cap Horn, Poiss., p. 16, 1888 (Estuaire de Santa Cruz de Patagonie).—GARMAN, Bull. Mus. Comp. Zool., vol. 17, p. 74, pls. 3–4, 1888 (lateral canal system).—PHILIPPI, Anal. Mus. Nac. Chile, sec. 1, pl. 4, 1892.

*Callorynchus tritoris* GARMAN, Bull. Mus. Comp. Zool., vol. 41, p. 271, pl. 6, fig. 9, 1904 [type locality: Mexillones, Peru (on nearly complete skeleton)]; Mem. Mus. Comp. Zool., vol. 40, p. 101, 1911 (copied).

Depth  $4\frac{1}{2}$  to subcaudal origin; head  $3\frac{1}{2}$ . Snout  $1\frac{1}{2}$  in head; eye 5,  $3\frac{1}{5}$  in snout; tritors of dental plates commonly elongate bars, as in young, not swollen and fused posteriorly, thus 2 tritors on each palatine plate; interorbital low.

Lateral line with short waves between ventrals and anal, below second dorsal, otherwise rather straight.

Dorsal spine inserted nearly over gill opening, nearly long as head, hind edge barbed terminally; second dorsal origin opposite ventral origin, front fin edge  $2\frac{1}{2}$  in head or  $1\frac{1}{2}$  in fin base; anal begins opposite end of second dorsal, length  $3\frac{2}{3}$  in head; caudal  $2\frac{1}{5}$  in rest of body, front subcaudal edge  $3\frac{1}{2}$  in head; pectoral reaches  $\frac{4}{5}$  to ventral, length  $2\frac{5}{6}$  to subcaudal origin, width  $2\frac{1}{3}$  its length; ventral  $2\frac{2}{5}$  in head.

With age more or less uniform silvery, varying pale or dark. Young with black spots on dorsal bases, on second dorsal tip, row of 4 or 5 along lateral line from second dorsal forward, sometimes large spot below eye and another above pectoral, also 1 on ventrals and one on subcaudal. (Lay and Bennett; Garman.)

Chile, Peru. Known chiefly by its short pectorals.

## Subclass TELEOSTOMI

Jaws and fins normally fishlike. Membrane head bones, as opercle, preopercle etc., developed. Skeleton sometimes cartilaginous, usually bony. Skull with sutures. Bones supporting fin rays called actinosts or pterygials, greatly modified, though concealed by body integument. Usually 2 bones connect pectoral fin with shoulder girdle. Hypercoracoid flat, square, usually perforated by foramen. Variation in coracoids, sometimes imperfect or specially modified. Lungs imperfectly developed, or degraded to form swim-vessel, or entirely absent. Heart developed, divided into an auricle, ventricle and arterial bulb. Gills with outer edges free, their bases attached to bony arches, normally four pairs and fifth pair typically modified into tooth-bearing lower pharyngeals. Ova small. Median and paired fins usually developed, latter with distinct rays. No claspers.

Among these, the true fishes, a number of the more generalized orders group themselves into several series, of which the ganoids may be considered first.

## Series GANOIDEI

Skeleton usually cartilaginous, sometimes very primitive. Air bladder highly developed, usually cellular and functional as a lung, but connects with upper side of gullet, not with ventral side as in dipnoans. Optic nerves crossing before reaching eyes, thus form more or less perfect chiasma. Arterial bulb of heart with many valves. Intestine with spiral valve. Usually an armature of bony plates present, diamond-shaped and with an enamel like that formed on teeth. Tail usually distinctly heterocercal, if only obviously so. Pectoral fin with numerous basal bones or actinosts.

The ganoid fishes form a purely provisional assemblage, showing many archaic features and therefore are grouped together nearest the crossopterygians or fringe fin stock of fishes. The great range of variation in structure and form likely indicate the remnants of a vast host of primitive fishes derived from some of the fringe fins. In Mesozoic seas ganoids were hardly less varied and perhaps scarcely less numerous than the teleosts living in the seas today. In number and variety of forms they greatly exceed the fringe fins. Of the six orders usually admitted, four are still represented by a few living forms.

### Order CHONDROSTEI

Teeth small or absent. Subopercle and preopercle absent. Branchiostegals few or absent. Cartilaginous vertebrae imperfectly developed. Notochord persistent. Axinosts and baseosts of median fins arranged in simple regular series, rays more numerous than supporting elements. Pelvic fins with well-developed baseosts. Shoulder girdle with pair of infraclavicular plates. Optic nerves forming chiasma. Intestine with spiral valve. Body naked or with longitudinal rows of bony plates. Rhombic plates on tail. One dorsal and one anal, distinct from caudal. Caudal usually heterocercal. Pair of pectorals and pair of ventrals.

A large group comprising nearly half of the extinct ganoid fishes besides the few living sturgeons, now thought degenerate modern forms. Families, three.

### Family ACIPENSERIDAE

Body elongate, partly cylindrical. Head large, robust. Snout depressed, extended, conic or partly spatulate, with sensory areolae on lower surface. Eyes small. Mouth small, inferior, protractile. Lips thick, produced into marginal lobes. No teeth, except microscopic ones in larval stages. Maxillary distinct from premaxillary. Four barbels in transverse row on snout below before mouth. Nos-

trils large, double, olfactory membrane with smooth central disk surrounded by rosette of folds. Gills 4, also accessory opercular gill. Branchial arches 5. Pseudobranchiae imperfect. Gill membranes joined to isthmus. No branchiostegals. Air bladder large, joined to esophagus with short pneumatic duct, sides spacious. Pancreas divided into mushroomlike pyloric appendages. Spiral valve in rectum. Five longitudinal rows of bony plates or bucklers, each with median keel ending in spine, sometimes obsolete with age. Plates as median dorsal, lateral and abdominal row each side, last sometimes deciduous. Skin between large plates rough with small irregular plates. Head covered with bony plates joined with sutures. Fin rays slender, articulated. Vertical fins with fulera. Dorsal fin posterior. Anal similar and somewhat behind. Tail heterocercal, lower lobe developed and upper covered with rhomboid scales. Pectorals moderate, low. Ventrals many rayed, small, behind middle of body.

Large sluggish fishes, living in the seas and fresh waters of northern countries. Their food is small or minute plant and animal life sucked in through the tubelike mouth. Great variation individually and with age has led to the description of many nominal forms. Genera, four or five among living forms.

#### Genus ACIPENSER Linnaeus

*Acipenser* LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 237, 1758. (Type, *Acipenser sturio* Linnaeus, designated by Jordan and Copeland, Bull. Buffalo Soc. Nat. Hist., vol. 3, p. 161, 1876.)

*Accipenser* GOUAN, Hist. Pisc., pp. 12, 13, 1770. (Type, *Acipenser sturio* Linnaeus.)

*Ichthyocolla* GEOFFROY, Descr. 719 plantes, p. 399, 1767. (Type, *Acipenser huso* Linnaeus.)

*Sterleta* GÜLDENSTÄDT, Nov. Com. Sci. Petropol., vol. 16, p. 533, 1772. (Species nonbinomial. Type, *Acipenser ruthenus* Linnaeens.)

*Sturio* RAFINESQUE, Indice Itt. sicil., p. 41, 1810. (Type, *Acipenser sturio* Linnaeus, monotypic.)

*Dinocetus* RAFINESQUE, Amer. Monthly Mag. Crit. Rev., vol. 3, p. 447, Oct. 1818. (Type, *Dinocetus truncatus* Rafinesque, monotypic. No description.)

*Sterletus* RAFINESQUE, Ichth. Ohiensis, p. 80, 1820. (Type, *Accipenser scorinus* Rafinesque= *Acipenser rubicundus* Lesueur, designated by Jordan and Gilbert, Proc. Acad. Nat. Sci. Philadelphia, 1877, p. 87.)

*Sterleda* BONAPARTE, Cat. Metod. Pesci Europei, p. 21, 1846. (Type, *Acipenser ruthenus* Linnaeus.)

*Dinctetus* RAFINESQUE, Ichth. Ohiensis, p. 82, 1820. (Type, *Dinctetus truncatus* Rafinesque= *Acipenser rubicundus* Lesueur, monotypic.)

*Ellops* MINDING, Lehrb. Naturg. Fische, p. 124, 1832. (Type, *Acipenser helops* Pallas.)

*Huso* BRANDT and RATZBURG, Med. Zool., vol. 2, p. 4, 1833. (Type, *Acipenser huso* Linnaeus, tautotypic.)

*Helops* (not Fabricius, 1775, in Coleoptera) MÜLLER, Abh. Akad. Wiss. Berlin, 1834, p. 73. (Type, *Acipenser stellatus* Pallas.)

*Antaceus* HECKEL and FITZINGER, Ann. Wiener Mus., vol. 1, pp. 269, 293, 1836.  
(Type, *Acipenser schypa* Güldenstädt).

*Lioniscus* HECKEL and FITZINGER, op. cit., p. 370. (Type, *Acipenser glaber* Fitzinger.)

*Schipa* BRANDT, Bull. Acad. Sci. Petersburg, vol. 7, p. 113, 1850. (Type, *Acipenser schypa* Güldenstädt.)

*Sinosturio* JAEKEL, Mon. Geol. Palaeont., vol. 3, text-fig. 25, 1929. (Type, *Acipenser dabryanus* Duméril.)

Snout mostly depressed below level of forehead, partly conic. Lower lip developed only at mouth corners. Gills rather small, narrow, slender. Pseudobranchiae small. Small spiracle above eye. Caudal peduncle deeper than wide, rather short, incompletely armored and rows of bony plates distinct to base of caudal fin. Tail not produced as filament, its tip surrounded by caudal rays.

Over 20 species known. Other more northern species in the Pacific are as follows:

#### ACIPENSER DAURICUS Georgi

*Acipenser dauricus* GEORGI, Reise im Russ. Reich., vol. 1, p. 352, 1775 (type locality: Amur; Argun; Schilka; Onon).—HECKEL and FITZINGER, Ann. Wiener Mus., vol. 1, p. 318, 1836 (copied).

*Acipenser (Sterletus) dauricus* DUMÉRIL, His. Nat. Poiss., Ganoides, vol. 2, p. 259, 1870 (part).

*Huso dauricus* BONAPARTE, Cat. Metod. Pesci Europei, p. 22, 1846 (reference).—BERG, Zapiski Acad. Sci. St. Petersbourg, vol. 24, p. 16, 1909 (Nikolajewsk, Onon R. 30 km. from Tschindinty, mouth of Amur R., Cape Naleo, Ussuri); Faune Russie Poiss., vol. 1, p. 146, pl. 4, 1911 (same material).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 30, figs. 5–6, 1930 (Far East seas).—TABANETZ, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 53, fig. 30, 1937 (head below).

*Acipenser orientalis* PALLAS, Zoogr. Rosso-Asiat., vol. 3, p. 107, 1811 (on Georgi and Steller).—MAACK, Travels in Amur, p. 28, 1859 (Schilka at Nertschinsk, Onon); Travels in Ussuri, p. 201, 1861 (Ussuri, Sungatschin, Lake Hanka).

*Huso orientalis* DYBOWSKI, Verh. zool.-bot. Gesell. Wien, vol. 22, p. 218, 1872 (Amur, Argun, Onon, Ussuri, Sungatschi, Lake Hanka); Rep. St. Petersbourg. Dep. Imp. Russ. Geogr. Soc., vol. 8, p. 23, 1877 (Amur, Argun, Onon).

*Acipenser kaluschka* (Steller) HECKEL and FITZINGER, Ann. Wiener Mus., vol. 1, p. 318, 1836 (name in synonymy).

*Acipenser mantschuricus* BASILEWSKY, Nouv. Mem. Soc. Imp. Nat. Moscou, vol. 10, p. 250, 1855 (type locality: Amur).

#### ACIPENSER SCHRENCKI Brandt

*Acipenser schrencki* BRANDT, Mélang. Biol. Soc. Acad. Sci. St. Petersbourg, vol. 7, p. 115, 1869 (type locality: Amur River and larger tributaries).—BERG, Zapiski Acad. Sci. St. Petersbourg, vol. 24, p. 20, 1909 (Nikolajewsk, Ussuri, Amur River mouth near Cape Maleo, 2 km. below Chor River mouth); Faune Russie, Poiss., vol. 1, p. 274, pl. 8, fig. 2, 1911 (above localities).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 31, figs. 7–8, 1930 (Far East seas).—TABANETZ, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 53 (reference), 1937.

*Sturio schrencki* DYBOWSKI, Verh. zool.-bot. Gesell. Wien, vol. 22, p. 219, 1872  
 (Amur, Ussuri, Sungatschin, Hanka, Argun, Onon); Rep. St. Peters-  
 bourg Dep. Imp. Russ. Geogr. Soc., vol. 8, p. 24, 1877 (above localities).  
*Acipenser sturio* (not Linnaeus) GEORGI, Reise im Russ. Reich., vol. 1, p. 352, 1775  
 (Schilka).—PALLAS, Zoogr. Rosso-Asiat., vol. 3, p. 91, 1811 (Eastern seas).—  
 МАЛК, Travels in Ussuri, p. 200, 1861 (Amur, Ussuri, Sungatschin, Lake  
 Hanka).

## ANALYSIS OF SPECIES

- a<sup>1</sup>. Snout obtuse or short, at least 1 or 2 times in postocular.
- b<sup>1</sup>. Dorsal rays III or IV, 31 to 36.
  - c<sup>1</sup>. Lateral plates 41 to 43; dorsal plates 15 or 16; ventral plates 12 to 16 *multiscutatus*
  - c<sup>2</sup>. Lateral plates 34; dorsal plates 7 or 8; ventral plates 9—*acutirostris*
  - b<sup>2</sup>. Dorsal rays III, 63; lateral plates 32; ventral plates 11—*kikuchii*
- a<sup>2</sup>. Snout elongate, attenuate, slender, at least longer than postocular.
  - d<sup>1</sup>. Lateral plates 33; no asperities between preopercle and opercle *dabryanus*
  - d<sup>2</sup>. Lateral plates 40 or 41; row of vertical asperities between preopercle and opercle—*chinensis*

## ACIPENSER MULTISCUTATUS Tanaka

*Acipenser multiscutatus* TANAKA, Journ. College Sci. Tokyo, vol. 23, art. 7, p. 21,  
 pl. 2, fig. 1, 1908 (type locality: 7 miles off Ikedohama, Iwaki, Tokyo).

Depth  $6\frac{2}{3}$  to subcaudal origin; head  $4\frac{4}{5}$ , width  $1\frac{3}{4}$ . Snout  $2\frac{2}{3}$  in head, short, rather obtuse; eye  $17\frac{1}{2}$ ; preoral length  $1\frac{7}{8}$ ; interorbital  $11\frac{1}{6}$ , longitudinally concave.

Dorsal plates 15 or 16, each with median longitudinal ridge, without distinct spine, large, rugose, close behind small plate from fourth to seventh; lateral plates 41 to 43, similar to dorsal, anterior 2 each with small plate in front and all well separated though without posterior small plate; ventral plates 12 to 16. Behind dorsal fin 4 or 5 rugose plates, 3 behind, 2 before anal; skin between rows of plates soft and smooth; large scapular plate with small one posterior; cheek with fine stellate prickles; skin with rather sparse, small, stellate prickles.

Dorsal begins behind ends of ventrals, front edge  $1\frac{1}{2}$  in head, rays VII, 35; anal begins behind middle of dorsal base, rays VII, 28; caudal  $3\frac{3}{5}$  in rest of body, subcaudal  $1\frac{1}{2}$  in caudal or equals head; pectoral  $1\frac{1}{2}$ ; ventral about 2.

Color ? Length, 2,120 mm. (Tanaka.)  
 Northern Japan.

## ACIPENSER ACUTIROSTRIS Ayres

*Acipenser acutirostris* AYRES, Proc. California Acad. Sci., vol. 1, p. 14, 1854 (type locality: San Francisco).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 344, 1870 (from Ayres).

*Acipenser medirostris* AYRES, Proc. California Acad. Sci., vol. 1, p. 15, 1854 (type locality: San Francisco).—KIRSCH and FORDICE, Proc. Acad. Nat. Sci. Philadelphia, 1889, p. 249, 1890 (San Francisco).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, p. 104, 1896 (compiled).—BERG, Faune Russie, Poiss., vol. 1, p. 287, pl. 8, fig. 3, 1911 (Hakodate and Aniwa Bay at Korsakowsk, Saghalin I.).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., voi. 5, p. 32, figs. 9–10, 1930 (Far East seas).—TARANETZ, Bull. Pacific Sci. Inst. Fisher. Oceanogr., vol. 11, p. 53, 1937 (reference).

*Acipenser (Antaceus) medirostris* DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 3, p. 167, pl. 13, fig. 2, 1867 (San Francisco); Hist. Nat. Poiss., Ganoides, vol. 2, p. 222, 1870.

*Acipenser (Antaceus) agassizii* DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 3, p. 181, pl. 11, fig. 2, 1867 (type locality: San Francisco); Hist. Nat. Poiss., Ganoides, vol. 2, p. 237, 1870 (type).

*Acipenser (Antaceus) alexandri* DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 3, p. 183, pl. 15, fig. 1a–b, 1867 (type locality: San Francisco); Hist. Nat. Poiss., Ganoides, vol. 2, p. 239, pl. 15, fig. 1, 1870 (type).

*Acipenser (Antaceus) oligopeltis* DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 3, p. 184, pl. 15, fig. 2, 1867 (type locality: San Francisco); Hist. Nat. Poiss., Ganoides, vol. 2, p. 241, 1870 (type).

*Acipenser mikadoi* HILGENDORF, Sitz. Ber. Naturf. Freunde Berlin, p. 98, 1892 (type locality: Tokyo market, doubtless from Hokkaido).—JORDAN and SNYDER, Journ. College Sci. Tokyo, vol. 15, p. 303, 1901 (Ishikari River, Teshio, Mikawa).—SCHMIDT, Pisces marinum orientalium, p. 284, 1904 (Hakodate).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 30, p. 398, 1906 (Ishigari River, Teshio and Mikawa streams, Hokkaido).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 185, 1920 (Ishikari-gawa).

Depth  $6\frac{1}{2}$  to 7; head  $3\frac{3}{4}$  to  $3\frac{4}{5}$ . Snout 2 to  $2\frac{1}{10}$  in head, short, rather sharp.

Dorsal plates 7 or 8; laterals 34; ventrals 9. Plates well keeled, with radiating striae, rather rugose; 4 to 6 plates behind dorsal; 2 to 4 plates behind anal; sides above, between series of large plates, with smaller mostly stellate plates, 14 forming irregular row behind dorsal series. Top of head long; cheeks with rough plates; opercle rugose.

D. IV, 31 to 36, fin height  $3\frac{1}{3}$  in head; A. III, 25 to 28; caudal  $1\frac{1}{5}$  in head.

Length, 1,200 mm. (Jordan and Snyder.)

Northern Japan. Also in the northeastern Pacific in California. Hilgendorf says it reaches 1,525 mm. He gives snout  $2\frac{1}{2}$  in head, moderately pointed; barbel nearer eye than snout tip; 10 dorsal plates, 30 or 31 laterals; D. 39 to 43. Length, 967 mm.

#### ACIPENSER KIKUCHII Jordan and Snyder

*Acipenser kikuchii* JORDAN and SNYDER, Journ. College Sci. Tokyo, vol. 15, p. 302, pl. 15, figs. 1–2, 1901 (type locality: Misaki, Sagami Bay); Proc. U. S. Nat. Mus., vol. 30, p. 307, 1906 (type).

Depth  $6\frac{2}{5}$  to subcaudal origin; head  $4\frac{1}{4}$ , width  $1\frac{3}{4}$ . Snout  $3\frac{3}{5}$  in head, short, sharp; eye ? ; preoral length  $1\frac{3}{4}$ ; interorbital  $2\frac{1}{10}$ , longitudinally concave.

Plates of back 11, large, rugose or warty, without distinct spines; lateral plates 32, each with spine in front; ventral plates 11, smooth. No bony plates on body except few small ones between large anterior ones of dorsal series; body skin soft and smooth between plates; opercle rugose; cheeks with fine stellate prickles.

Dorsal origin entirely behind ventrals, front edge  $1\frac{4}{5}$  in head, with more than 60 rays; anal origin opposite last  $\frac{2}{5}$  of dorsal base, front edge  $1\frac{3}{4}$  in head, with 40 rays; caudal  $4\frac{1}{5}$  in rest of body, front edge of subcaudal  $1\frac{1}{2}$  in head; pectoral  $1\frac{3}{5}$ ; ventral  $2\frac{1}{6}$ .

Color ? Length, 1,800 mm. (Jordan and Snyder.)

Japan. The type was captured in the open sea at Misaki and prepared as a dry mounted specimen for the Museum of the Imperial University at Tokyo.

#### ACIPENSER DABRYANUS Duméril

*Acipenser (Antaceus) dabryanus* DUMÉRIL, Nouv. Arch. Mus. Hist. Nat. Paris, vol. 4, p. 98, pl. 22, fig. 1, a-b, 1868 (type locality: Yantze-Kiang).

*Acipenser (Acipenser) dabryanus* DUMÉRIL, Hist. Nat. Poiss., Ganoides, vol. 2, p. 193, 1870 (type).

*Acipenser dabryanus* MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Jinsen and Ruganho, Korea).

Depth 8 to subcaudal origin; head  $3\frac{1}{4}$ , width  $2\frac{1}{5}$ . Snout  $1\frac{9}{10}$  in head, elongate, narrowly triangular; eye  $14\frac{1}{2}$ ,  $7\frac{3}{4}$  in snout; barbels near last  $\frac{2}{5}$  in snout length; interorbital  $3\frac{2}{5}$  in head.

Dorsal plates 12, each ending in rather large spine, rugose; 33 lateral plates, rather small and well spaced; ventrals 10, rugose, each with strong spine.

Dorsal falls close behind depressed ventral ends, front edge  $2\frac{4}{5}$  in head, rays 42; anal origin about opposite last  $\frac{2}{5}$  of dorsal base, front edge  $3\frac{1}{5}$  in head, rays 30; caudal equals head, front edge of subcaudal  $1\frac{9}{10}$ ; pectoral 2; ventral  $3\frac{1}{4}$ .

Back brown to lateral keels, rest of body yellowish white with silvery sheen on belly. Length, 350 mm. (Duméril.)

Yang-tze-kiang, China, Korea.

#### ACIPENSER CHINENSIS Gray

*Acipenser chinensis* GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, pl. 98, fig. 5, 1832-34 (type locality: China).—RICHARDSON, Ichth. China Japan, p. 198, 1846 (China).—GRAY, List fish British Museum, vol. 1, p. 6, 1851 (China).

*Acipenser (Acipenser) chinensis* DUMÉRIL, Hist. Nat. Poiss., Ganoides, vol. 2, p. 191, 1870 (China, probably Hong Kong).

*Acipenser sinensis* GRAY, Proc. Zool. Soc. London, 1834, p. 122 (China).—FITZINGER and HECKEL, Ann. Wiener Mus., Zool. Abhandl., vol. 1, p. 275, 1836 (copied).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 8, p. 338, 1870 (types).—

SAUVAGE and DE THIERSANT, Ann. Sci. Nat., ser. 6, vol. 1, Zool., p. 18, 1874 (China).—ELERA, Cat. Fauna Filip., vol. 1, p. 63, 1895 (Luzon, Cavite, Santa Cruz [doubtful, perhaps imported market specimens]).—NICHOLS, Bull. Amer. Mus. Nat. Hist., vol. 58, art. 1, p. 2, 1928 (reference).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Reisul, Korea).—WU, Contr. Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 15, fig. 11, 1929 (Amoy).—FOWLER, Hong Kong Nat., No. 6, p. 4, 1938 (Hongkong).

Depth  $6\frac{2}{3}$  to subcaudal origin; head  $2\frac{2}{3}$ . Snout  $1\frac{7}{8}$  in head, elongately triangular; eye  $1\frac{3}{4}$ , 8 in snout; barbels short, thin, much nearer eye than snout tip; interorbital moderately low.

Dorsal plates 17, with strong spine and rugose striate; 40 or 41 lateral plates, each with keel, overlapping; vertical row of minute denticles between preopercle and opercle, skin of body otherwise entirely smooth.

Dorsal origin close behind ends of depressed ventrals, front fin edge  $2\frac{4}{5}$  in head, rays 50; anal begins nearly opposite middle of dorsal base, fin length  $3\frac{3}{5}$ ; caudal  $1\frac{1}{6}$  in head, front subcaudal edge  $2\frac{1}{2}$ ; pectoral  $2\frac{1}{3}$ ; ventral  $4\frac{1}{5}$ .

Back dull plum color to row of lateral scutes, rest of body more or less pale brownish on fins and armature, otherwise whitish. (Gray; Günther.)

China, Amoy, Korea. Duméril's specimen was 280 mm. and he gives dorsal rays 47, anal 30.

### Series TELEOSTEI

Skeleton bony, firm. Air bladder, if present, not cellular or functional as lung, usually simple or with slender duct communicating with intestinal tract. Optic nerves crossing, not forming solid chiasma. Arterial bulb thin, with pair of opposite valves. Intestine simple, without spiral valve. Armature, when present, usually of scales of rounded design. Tail homocercal.

The remaining vast group of living fishes, not included in the small series of ganoids, is included in the present assemblage. It contains largely very heterogeneous orders, sometimes made up of various forms apparently dissimilar.

### Order ISOSPONDYLI

Bones of jaws developed. Maxillary wide, distinct from premaxillary, forms part of upper edge of mouth gape. Opercular apparatus distinct, complete. Pharyngeal bones simple above and below, lower not scythe shaped. Gill openings wide. Gills four, slit behind fourth. Air bladder small or absent, with duct when present. Skeleton mostly firmly ossified. Symplectic bone present. No interclavicles. Front vertebrae simple, not modified, without

auditory ossicles. Mesocoracoid arch always well developed, forms bridge from hypercoracoid to hypocoracoid. Shoulder girdle well developed, joined to cranium by bony post-temporal. Scales usually cycloid. No developed photophores. Dorsal and anal fins without true spines. Ventrals abdominal, sometimes absent.

A large group of marine fishes, seldom in fresh water, the fossils fewer though better represented than most bony fishes. As some show characters like those of the higher ganoids or bowfins, these have been thought to suggest possible lines of descent.

#### ANALYSIS OF FAMILIES

- a<sup>1</sup>. CLUPEOIDEI.* Scales cycloid, absent from head; mouth without barbels.
- b<sup>1</sup>.* Dorsal median, not far posterior.
- c<sup>1</sup>.* Lateral line present.
- d<sup>1</sup>.* Branchiostegals 12 to 20 or more.
- c<sup>2</sup>.* Gular plate present between each ramus of lower jaw; mouth large; teeth small, pointed; axillary scales and sheaths large; dorsal median or before anal----- **Elopidae**
- e<sup>2</sup>.* No gular plate at chin.
- f<sup>1</sup>.* Dorsal median, over ventral; mouth inferior----- **Albulidae**
- f<sup>2</sup>.* Dorsal post median, over anal; mouth superior or terminal. ----- **Osteoglossidae**
- d<sup>2</sup>.* Branchiostegals 4 to 9.
- g<sup>1</sup>.* Anal short, posterior.
- h<sup>1</sup>.* Dorsal median, rays few----- **Chanidae**
- h<sup>2</sup>.* Dorsal extensive over back, rays numerous----- **Pterothrissidae**
- g<sup>2</sup>.* Anal greatly elongate, confluent with abortive caudal; dorsal small or absent----- **Notopteridae**
- c<sup>2</sup>.* No lateral line.
- i<sup>1</sup>.* Stomach gizzardlike; mouth small, inferior, toothless; maxillary simple or nearly so----- **Dorosomidae**
- i<sup>2</sup>.* Stomach not gizzardlike.
- j<sup>1</sup>.* Mouth moderate, terminal; maxillary usually in 3 pieces.
- k<sup>1</sup>.* Belly rounded, covered with ordinary scales; supplemental maxillary very narrow----- **Stolephoridae**
- k<sup>2</sup>.* Belly compressed, with bony serrae; supplemental maxillary broad----- **Clupeidae**
- j<sup>2</sup>.* Mouth very large, partly to quite inferior, below tapering piglike snout; maxillary very long----- **Engraulidae**
- b<sup>2</sup>.* Dorsal far back, opposite anal; teeth large----- **Chirocentridae**
- a<sup>2</sup>. GONORYNCHOIDEI.* Scales etenoid, covering head as well as body; mouth with barbels----- **Gonorynchidae**

#### Family ELOPIDAE

Body elongate or oblong, mostly compressed. Mouth large, terminal, lower jaw conspicuous, lateral borders of jaws formed by maxillaries. Premaxillaries short, not protractile. Maxillary with two supplemental bones. Elongate bony gular plate between branches of lower jaw. Villiform teeth in jaws, on vomer, palatines,

pterygoids, and tongue. Gill rakers rather long. Gill membranes free, separated. Pseudobranchiae present or absent. Branchiostegals numerous, over 20. Air bladder large. Scales cycloid. Belly without keels or scutes. Head naked, with collar of large thin scales around occiput. Paired fins with long, scaly axillary flaps. Lateral line straight, with simple or branched tubes. Dorsal slightly behind ventral origin. Anal far behind dorsal. Caudal forked. Pectorals low, fold like ventrals. Ventral rays 10 to 16.

Widely distributed in tropical and subtropical seas, sometimes entering fresh water. Genera few. Though of large or moderate size not valued as food, as the rank flesh is full of numerous small bones. The young pass through a metamorphosis, like the *Leptocephalus* stage of the eels, though easily known by their forked tails.

#### ANALYSIS OF GENERA

*a<sup>1</sup>*. Body deep, oblong; scales large; last dorsal ray ends in filament— *Megalops*

*a<sup>2</sup>*. Body slenderer; scales small; fins without filaments----- *Elops*

#### Genus MEGALOPS Lacépède

*Megalops* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 289, 1803. (Type, *Megalops filamentosus* Lacépède = *Clupea cyprinoides* Broussonet, monotypic.) (Precludes *Megalops* Leach 1814, Rafinesque 1815, Dejean 1833, Erichson 1840, Hallowell 1860.)

*Brisbania* CASTELNAU, Proc. Linn. Soc. New South Wales, vol. 2, p. 241, 1878. (Type, *Brisbania staigeri* Castelnau, monotypic.)

*Tarpon* JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, pt. 1, 1896, p. 409. (Type, *Megalops atlanticus* Valenciennes, monotypic.)

Body oblong, elongate, well compressed. Eyes large, with adipose lids. Mouth very large, oblique, reaches behind eye. Teeth in jaws, on vomer, palatines, pterygoids and tongue villiform. Gill rakers lanceolate. Pseudobranchiae absent. Branchiostegals 23 to 27. Scales large, tough, silvery. Anal without basal scaly sheath, though basally with smaller scales. Lateral line with branched tubes. Dorsal inserted little or well behind ventrals, little shorter than anal, last ray greatly elongated. Ventral rays 10 or 11.

Tropical seas, entering rivers. The young pass through a long ribbonlike transparent larval stage.

#### MEGALOPS CYPRINOIDES (Broussonet)

*Clupea cyprinoides* BROUSSONET, Ichth., no pagination, pl. 9, 1782 (type locality: Oceans between the Tropics [not Jamaica and Antigua or Rio Janeiro, Brazil]; Tanna Island, South Pacific).—BONNATERRE, Tabl. encyl. Ichth., p. 187, pl. 75, fig. 314, 1788 (Pacific Ocean).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1407, 1789 (copied).—WALBAUM, Artedi Pisc., vol. 3, p. 40, 1792 (copied).—BLOCH, Naturg. ausländ. Fische, vol. 9, p. 32, pl. 403, 1795 (Pacific Ocean, Tanna).—SCHNEIDER, Syst. Ichth. Bloch, p. 427, 1801 (Trans-

quebar).—LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 424, 458, pl. 13, fig. 3, 1803 (Pacific Ocean).—LICHENSTEIN, Descr. Anim. Forster, p. 296, 1844 (Tanna Island).

*Megalops cyprinoides* SWAINSON, Nat. Hist. Animals, Fishes, vol. 2, p. 292, 1838 (on Bloch).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 471, 1858 (Zanzibar, Shire River, Madras, Bengal, Pinang, Java, Sumatra, Amboina, East Indies, Formosa, Aneiteum, Cape York, Port Essington).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 85, pl. (12) 270, fig. 4, 1866–72 (Java and Celebes).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 37, 1874 (Kandavu; Upolu).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 2, p. 364, 1878 (Port Darwin).—GÜNTHER, Philos. Trans. Roy. Soc. London, vol. 168, p. 471, 1879 (Rodriguez).—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Viti; Samoa).—GÜNTHER, Rep. Voy. Challenger, vol. 1, p. 33 (Mary River, Queensland), p. 36, 1880 (Ovalan, Fiji).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 383, 1880 (Hawkesbury River; Port Darwin).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 5, p. 107, 1881 (Swatow).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 262, 1881 (reference); vol. 8, p. 210, 1883 (Lower Burdekin River, Queensland), p. 278, 1884 (Goldie River in fresh water, New Guinea).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 88, pt. 1, 1883, p. 1108, 1884 (= *Brisbania staigeri*).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Samoa).—MEYER, Anal. Soc. Espan. Hist. Nat., Madrid, vol. 14, p. 43, 1885 (Kordo, Mysore).—OGILBY, Cat. Fish. New South Wales, p. 57, 1886 (compiled).—DAY, Fauna British India, Fishes, vol. 1, p. 402, fig. 126, 1889.—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 497, pl. 49a, fig. 3, 1891 (Onilahy or Saint Augustin; Morondewa, Titsobohana, Mammambolo).—KENT, Great Barrier Reef, pp. 302, 370, pl. 45, fig. 6, 1893 (Rockhampton; Queensland).—ELERA, Cat. Fauna Filip., vol. 1, p. 584, 1895 (Manila, Luzon).—RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 63 (compiled).—KENT, Naturalist in Australia, p. 175, 1897 (Moreton Bay).—SEALE, Occ. Pap. Bishop Mus., vol. 1, No. 3, 1900, p. 63, 1901 (Guam).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 327, 1902 (Formosa, Giran).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, 1903, p. 186, 1904 (Kuala Lumpur).—JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Negros).—SEALE, Occ. Pap. Bishop Mus., vol. 4, No. 1, p. 63, 1906 (Tubuai, Austral Islands).—JORDAN and SEALE, Bull. Bur. Fisher., vol. 25, (1905), p. 185, 1906 (Apia).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 615, 1906 (Nafa; Tokyo).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26, 1906, p. 53, 1907 (Bulan and Tarlac).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 32, p. 492, 1907 (Okinawa).—LLOYD, Rec. Indian Mus., vol. 1, p. 221, 1907 (Akyab).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 270, 1908–11 (Natal).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 387, 1909 (Indian Ocean, South Sea, Society Islands).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 165, 1909 (copied).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 204 (Apia).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 489, 1912 (Naha, Okinawa).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 589, 1912 (Batavia).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 52, 1913.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 5, fig. 4, 1913 (Batavia, Tambak, Sumur, Makassar, Ceram, Merauke).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 1, 1913 (Macassar); Nova Guinea, vol. 9, p. 515, 1913 (Lorentz River, Alkmaar, Meranue).—OGILBY, Commercial Fish. Fisher. Queensland, p. 46, 1915 (Brisbane); Mem. Queensland Mus., vol. 5, p. 96,

1916 (Queensland coast).—CHAUDHURI, Mem. Indian Mus., vol. 5, p. 417, 1916.—ROUGHLEY, Fishes of Australia, p. 11, pl. 1, 1916 (north and east coasts, New South Wales).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 292, 1917 (reference).—FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines).—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 175, 1923 (Nontaburi); Mem. Asiatic Soc. Bengal, vol. 6, p. 479, 1924 (Tale Sap, Inner Lake).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—FOWLER, Bishop Mus. Bull. 22, p. 4 (Guam), p. 31, 1925 (Samoa).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 104, fig. 11, 1925 (young).—OSHIMA, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Haiha, Hainan).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>e</sup> note, p. 7, 1926 (Gulf of Siam).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 15, pl. 4, fig. 46a, 1927.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1927, p. 256 (Philippines, San Fernando, Vigan, Orani).—HERRE, Philippine Journ. Sci., vol. 34, p. 296, 1927 (Lake Taal; Mindoro).—FOWLER, Mem. Bishop Mus., vol. 10, p. 27, 1928 (Guam, Tubuai, Apia).—MCCULLOCH, Australian Mus. Mem., vol. 5, p. 34, 1929 (reference).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, pp. 123, 174, 1929 (Saigon, Cholon, Cochinchina).—SCHMIDT, Journ. Pan-Pacific Res. Inst., vol. 5, p. 2, 1930.—FOWLER, Hong Kong Nat., vol. 2, p. 49, fig. 2, 1931 (Philippines, Micronesia, Polynesia); Mem. Bishop Mus., vol. 11, p. 314, 1931 (reference).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 99, 1931 (Bagan Si Api Api).—HERRE, Journ. Pan-Pac. Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped., 1931, p. 13, 1934 (Bauang Sur; Bulacan; Manila).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 67, 1934 (10 miles north of Padang Baai, Bali).—ROXAS, Philippine Journ. Sci., vol. 55, p. 239, pl. 1, fig. 1 (scale), 1934 (Luzon; Mindoro; Guimaras; Negros; Palawan; Balabac; Camiguin).—HERRE, Mid-Pacific Magazine, vol. 10, No. 2, p. 163, April–June 1935 (Pelew Is. in fresh water); Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 25, 1936 (New Hebrides, Tahiti, Fiji).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 129, 1937 (Bangkok).—SUUVATTI, Index Fish. Siam, p. 8, 1937 (Maenam Canthaburi, Samut Prakan, Ko Tau).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 18, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 11, 1937 (Pulau Ubi near Singapore).—FOWLER, List Fish. Malaya, p. 21, 1938 (reference).

*Elops cyprinoides* PETERS, Monatsb. Akad. Wiss. Berlin, p. 272, 1868 (Bicol R., Luzon).—MARTENS, in von der Decken's Reise Ost Afrika, vol. 3, pt. 1, 1859–61, p. 143, 1869 (Pangani River, Kisanga Peninsula, Sumpfeat Limbo and Kilimane, Zanzibar, Tette and Boror).

*Clupea thrissoides* (part) SCHNEIDER, Syst. Ichth. Bloch, p. 424, 1801 (Atlantic and Pacific Oceans). (On Broussonet.)

*Megalops filamentosus* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 289, 290, pl. 13, fig. 3, 1803 (type locality: Fort Dauphin, Madagascar).—SWAINSON, Nat. Hist. Animals, vol. 2, p. 293, 1839 (on *Kundinga* Russell, Fishes of Coromandel, vol. 2, p. 81, pl. 203, 1803, Vizagapatam).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 86, pl. (15) 273, fig. 1, 1866–72 (Java, Madura, Bali, Timor, Ceram).

*Cyprinodon cundina* BUCHANAN-HAMILTON, Fishes of Ganges, pp. 254, 283, 1822 (type locality: Salt-water estuaries of Ganges River).

*Elops cundina* CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1271, 1849 (sea and fresh water, Pinang, Malayan Peninsula).

- Megalops kundingi* JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 87, pl. (16) 274, fig. 1, 1866-72 (Java).
- Megalops setipinnis* RICHARDSON, Ann. Mag. Nat. Hist., vol. 11, p. 493, 1843 (type locality: Port Essington and Coburg Peninsula); Ichth. China Japan, p. 310, 1846 (Chinese Seas).
- Clupea setipinna* (Forster) VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 285, 1846 (Tahiti). (Name in text.)
- Megalops setipinna* BLEEKER, Nederland. Tijdschr. Dierk., vol. 1, p. 345, 1863 (Madagascar).
- Megalops curtifilis* RICHARDSON, Ichth. China Japan, p. 310, 1846 (type locality: Chinese Seas).
- Megalops indicus* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 388, pl. 542, 1846 (type locality: Fort Dauphin, Madagascar; Mauritius; Bouru; Coromandel; Pondicherry; Malabar; Alipey; Canaror; Panimbang; Java; Tahiti; Tanna).—KNER, Reise Novara, Fische, p. 339, 1865 (Java).—STEINDACHNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 56, pt. 1, p. 319, 1867 (Cape York).
- Megalops macrophthalmus* BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 1, p. 421, 1850 (type locality: Batavia, Java); Verh. Batav. Genootsch. (Chiroc.), vol. 24, p. 15, 1852 (Batavia).
- Elops apalike* (not Lacépède) DAY, Fishes of Malabar, p. 228, 1865 (Malabar).
- Megalops macropterus* BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 284, 1866 (type locality: Java, Sumatra, Singapore, Bintang, Celebes, Amboina); Atlas Ichth. Ind. Néerland., vol. 6, p. 85, pl. (15) 273, fig. 2, 1866-72.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 594, 1883 (New Guinea).
- Megalops oligolepis* BLEEKER, Nederland. Tijdschr. Dierk., vol. 3, p. 292, 1866.
- Brisbania staigeri* CASTELNAU, Proc. Linn. Soc. New South Wales, vol. 2, p. 241, pl. 3, 1878 (type locality: Brisbane River, Queensland).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 258, 1881 (reference); vol. 8, p. 288, 1882 (Lower Burdekin River).—KENT, Great Barrier Reef, pp. 302, 370, 1893.
- Depth  $3\frac{1}{8}$  to  $3\frac{3}{4}$ ; head  $3\frac{1}{4}$  to  $3\frac{3}{5}$ , width 2 to  $2\frac{1}{2}$ . Snout  $3\frac{7}{8}$  to  $4\frac{1}{2}$  in head from snout tip; eye 3 to  $3\frac{1}{2}$ , greater than snout or interorbital, with moderately narrow adipose lid, most evident with age; maxillary reaches opposite or little beyond hind eye edge, expansion  $1\frac{4}{5}$  to  $2\frac{3}{4}$  in eye, length  $1\frac{2}{3}$  to  $1\frac{4}{5}$  in head from snout tip; interorbital  $4\frac{1}{4}$  to  $5\frac{1}{2}$ , convex; slender gular plate  $2\frac{4}{5}$  to 3 in head measured from tip of mandible. Gill rakers 15 to  $17+30$  or 31, lanceolate,  $\frac{1}{4}$  longer than gill filaments, which  $\frac{1}{2}$  of eye.
- Scales 35 to 37 in lateral line to caudal base and 3 or 4 more on latter; 5 or 6 above, 6 below, 12 to 20 predorsal. Tubes of lateral line with 3 or 4 branches. Scales rather narrowly imbricated, smaller on caudal base, small and crowded on anal base. Scales with about 10 to 16 basal radiating striae, reticulations medially.
- D. iv or v, 13, i to 15, i, fourth simple ray  $1\frac{1}{8}$  to  $1\frac{3}{4}$  in total head length; A. iv, 19, i to 23, i, fourth simple ray  $1\frac{2}{5}$  to  $3\frac{1}{5}$ ; least depth of caudal peduncle  $2\frac{3}{4}$  to  $3\frac{1}{3}$ ; pectoral  $1\frac{1}{3}$  to  $1\frac{2}{3}$ ; ventral  $1\frac{7}{8}$  to  $2\frac{1}{4}$ ; caudal deeply forked, 3 to  $3\frac{3}{5}$  in rest of body.

Back brown, sides and below silvery white. Vertical fins and pectorals above gray to dusky, otherwise fins whitish.

Zanzibar, East Africa, Natal, Madagascar, Rodriguez, India, Ceylon, Malacca, East Indies, Philippines, China, Riu Kiu, Japan, Formosa, Queensland, New South Wales, North Australia, West Australia, Melanesia, Micronesia, Polynesia. Though marine it sometimes enters fresh waters. In my Fishes of Oceania the lower gill rakers are given as 13; they should have read 33.

- 5986 [748]. Cavite market. December 1, 1908. Length, 148 mm.  
 21001. Creek below Pancol, Malampaya Island, Palawan. December 26, 1908. Length, 195 mm.  
 22248, 22350 to 22355. Dampalit, near Malabon. August 10, 1908. Length, 95–192 mm.  
 6058. Dumaca River, Luzon. February 25, 1909. Length, 218 mm.  
 6639. Iloilo market. March 28, 1908. Length, 215 mm.  
 5824. Iwahig River and tributary. April 4, 1909. Length, 178 mm.  
 7401. Malaga River, Hinunangan Bay, Leyte Island. July 30, 1909. Length, 212 mm.  
 1 example. Malabon market. August 8, 1908. Length, 103 mm.  
 4908, 4909, 4913, 18935, 18936. Malinao River, Palawan. April 2, 1909. Length, 183–245 mm.  
 9082 to 9084. Manila market. June 24, 1908. Length, 240–247 mm. 4 examples.  
 7175 and 7177. Panguran River, Port Caltom. December 16, 1908. Length, 204–244 mm.  
 22290. River at Port Dupon, Leyte. In brackish water. March 17, 1909. Length, 123 mm.  
 12624, 12625. Santiago River, Pagapas Bay, Luzon. February 20, 1909. Length, 185–228 mm.  
 U.S.N.M. No. 30509. New Guinea. Australian Museum. Length, 343 mm.  
 U.S.N.M. No. 30540. New Guinea. Australian Museum. Length, 300 mm., caudal damaged.  
 U.S.N.M. No. 47800. No locality. Length, 390 mm.  
 U.S.N.M. No. 47902. Port Jackson. Length, 518 mm.  
 U.S.N.M. No. 51970. Negros, Philippines. Dr. Bashford Dean. Length, 68–70 mm., caudal tips damaged. 2 examples.  
 U.S.N.M. No. 52355. Apia, Samoa. Bureau of Fisheries. Length, 108–206 mm. 5 examples.  
 U.S.N.M. No. 56077. Philippines. Bureau of Fisheries (4183). Length, 440 mm., caudal largely broken off.  
 U.S.N.M. No. 59005. Bacon, Philippines. Bureau of Fisheries (4052). Length, 243 mm.  
 U.S.N.M. No. 59863. New South Wales. Length, 424 mm.  
 U.S.N.M. No. 72088. Nafa, Okinawa, Riu Kiu. *Albatross* collection. Length, 229 mm.  
 U.S.N.M. No. 72488. Batavia, Java. April 2, 1909. Bryant and Palmer. Length, 268 mm.  
 U.S.N.M. No. 72489. Batavia. 1909. Bryant and Palmer. Length, 240–250 mm. 3 examples.  
 U.S.N.M. No. 86978. Foochow, China. A. de C. Sowerby. Length, 245 mm. 2 examples. A.N.S.P. Apia, Samoa. U. S. Fish Commission. Length, 192–197 mm. From one example I took a small *Apogon* in good preservation.

### Genus ELOPS Linnaeus

*Elops LINNAEUS*, Syst. Nat., ed. 12, vol. 1, p. 518, 1766. (Type, *Elops saurus* Linnaeus, monotypic.)

*Mugilomorus* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 397, 398, 1803. (Type, *Mugilomorus anna-carolina* Lacépède, monotypic.)

*Trichonotus* (not Schneider 1801) RAFINESQUE, Analyse de la nature, p. 88, 1815. (Type, *Mugilomorus anna-carolina* Lacépède, virtually. *Trichonotus* Rafinesque, proposed to replace *Mugilomorus* Lacépède.)

Body elongated. Mouth little inclined. Maxillaries very long. Fine teeth in jaws, on vomer, palatines, pterygoids, and tongue. Pseudobranchiae well developed. Branchiostegals 27 to 34. Vertebrae 63 to 79, of which 29 caudal. Scales small, thin. Dorsal and anal both depressible in basal scaly sheaths. Paired fins each with long scaly flap. Lateral line straight, tubes simple. Dorsal slightly behind ventrals. Anal similar, smaller. Paired fins moderate. Ventral rays 17 or 18.

Large fishes of tropical or subtropical seas, sometimes entering tidal rivers. All are brilliant silvery in color. Young transparent, bandlike, changing with age like those of *Megalops* and *Albula*.

#### ELOPS SAURUS Linnaeus

*Elops saurus* LINNAEUS, Syst. Nat., ed. 12, vol. 1, p. 518, 1766 (type locality: Carolina).—CUVIER, Règne animal, vol. 2, p. 177, 1817 (reference).—VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 365, 1847 (Massauah, Red Sea, Mauritius, Pondicherry, Coromandel).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1269, 1849 (Sea of Pinang).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—BLEEKER Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853 (Japan); Nat. Tijdschr. Nederland. Indië, vol. 21, p. 56, 1860 (reference).—GUICHENOT, Notes île Réunion, vol. 2, p. 29, 1863.—KNER, Reise Novara, Fische, p. 338, 1865 (Madras).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 84, pl. (10)218, fig. 3, 1866–72 (Java, Madura, Pinang, Singapore, Celebes).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 470, 1868 (Zanzibar, Djedda, Pinang, China, Cape of Good Hope).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 603, 1871 (Red Sea).—BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 147, 1874 (compiled).—DAY, Fishes of India, pt. 4, p. 649, pl. 166, fig. 1, 1878.—CASTELNAU, Proc. Linn. Soc. New South Wales, vol. 2, p. 241, 1878 (Singapore, Malacca, Cape of Good Hope, Brisbane).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 382, 1880 (Port Jackson); vol. 6, p. 261, 1881 (Port Jackson; north coast); vol. 7, p. 594, 1883 (New Guinea); vol. 8, p. 210, 1883 (Lower Burdekin River).—MEYER, Anal. Soc. Españo. Hist. Nat., Madrid, vol. 14, p. 42, 1885 (North Celebes).—OGILBY, Cat. Fish. New South Wales, p. 56, 1886 (reference).—BOULENGER, Proc. Zool. Soc. London, p. 666, 1887 (Muscat).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 497, pl. 49a, fig. 4, 1891.—KENT, Great Barrier Reef, pp. 302, 307, 1893 (Cooktown, Townsville, Bowen).—ELERA, Cat. Fauna Filip., vol. 1, p. 584, 1895 (Luzon, Manila Bay).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 8, 1897.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, p. 406, 1900 (Hawaiian Islands).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, Math.-nat. Kl., vol. 70, p. 513, 1901 (Honolulu).—JENKINS, Bull. U. S. Fish Comm., vol. 22

(1902), p. 432, 1904 (Honolulu).—WAITE, Rec. Australian Mus., vol. 6, pt. 2, p. 58, 1905 (Murray River near Mandurah).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), p. 53, 1905 (Honolulu).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 616, fig. 1, 1906 (compiled).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 53, 1907 (Bulan).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 32, p. 492, 1907 (Okinawa).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27 (1907), p. 235, 1908 (Manila).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 270, 1908–11 (Natal).—BOULENGER, Catalogue fresh water fishes Africa, vol. 1, p. 25, fig. 17, 1909 (Senegal, Zanzibar, East Africa, Cape of Good Hope).—FRANZ, Abh. Bayer. Akad. Wiss., vol. 4, Suppl. vol. 1, p. 4, 1910 (Sagami Bay and Aburatsubo).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 50, pl. 2, 1913 (Algoa Bay, East London, Natal, Delagoa Bay).—BOULENGER, Catalogue fresh water fishes of Africa, vol. 4, p. 152, 1916 (note).—IZUKA and MATSUURA, Cat. Zool. Spec. Mus. Tokyo, Vertebr., p. 184, 1920 (Tokyo market).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 103, pl. 6, fig. 1, 1925 (Port Elizabeth to Delagoa Bay).—OSHIMA, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Hailuo, Hainan).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 354, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> Note, p. 123, 1929 (Cochin China).

*Argentina machnata* FORSKÅL, Descript. Animal., pp. XIII, 68, 1775 (type locality: Djedda, Red Sea).—BONNATERRE, Tableau encyclop. Ichth., p. 176, 1788 (Red Sea).—GMELIN, Syst. Nat. Limn., vol. 1, p. 1395, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 46, 1792 (copied).—LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 365, 367, 1803 (Arabia).—SHAW, General zoology, vol. 5, p. 129, 1804.

*Elops machnata* RÜPPELL, Neue Wirbelth., Fische, p. (80)84, 1835 (Red Sea).—RICHARDSON, Ichth. China Japan, p. 311, 1846 (Canton; seas of China); Voy. *Erebus* and *Terror*, Fishes, p. 59, pl. 30, figs. 3–5, 1846 (China).—SCHLEGEL, in Siebold's Fauna Japonica, Pisces, pts. 10–15, 241, pl. 109, fig. 2, 1850 (Southwest coast Japan; Korea).—DAY, Fishes of Malabar, p. 227, 1865.—GÜNTHER, Fishes of Zanzibar, p. 121, figs. (tails), 1866 (Zanzibar).—SAUVAGE, Hist. Nat. Madagascar, Poiss., p. 497, pl. 49a, fig. 4, 1891.—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 52, 1901 (reference).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 327, 1902 (Formosa, Suwata).—REGAN, Ann. Mag. Nat. Hist. ser. 8, vol. 3, p. 39, 1909 (Madras, Cape of Good Hope, South Africa, China, Lake Nyasa, Shiré River).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 589, 1912 (Batavia).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 4, 1913 (note).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 29, 1917 (references).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 119, 1925 (Misaki and Kobe markets).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—FOWLER, Hong Kong Nat. vol. 2, p. 50, 1931 (compiled); List Fish. Malaya, p. 21, 1938 (reference).

*Elops indicus* SWAINSON, Nat. Hist. Animals, vol. 2, p. 292, 1839 (on *Jinagow* Russell, Fishes of Coromandel, vol. 2, p. 63, pl. 179, 1803, type locality: Vizagapatam).

*Elops capensis* ANDREW SMITH, Ill. zool. South Africa, Fishes, pl. 7, 1849 (type locality: Cape of Good Hope).—CASTELNAU, Mem. Poiss. Afrique Australe, p. 67, 1861 (Port Natal).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 50, pl. 2, 1913 (Natal).

*Elops purpurascens* RICHARDSON, Ichth. China Japan, p. 311, 1846 (type locality: Chinese Seas).

*Elops australis* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 3, p. 39, 1909 (type locality: New South Wales).

*Elops hawaiiensis* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 3, p. 39, 1909 (type locality: Hawaii).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 165, pl. 66, upper fig., 1909 (Takao).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 386, 1909 (Hawaii).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 204 (Honolulu).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 489, 1912 (Naha, Okinawa).—WEBER, *Siboga Exped.*, Fische, vol. 57, p. 1, 1913 (Macassar).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 3, fig. 2, 1913 (Batavia and Macassar).—OGILBY, Commerc. Fish. Fisher. Queensland, p. 46, 1915 (Brisbane); Mem. Queensland Mus., vol. 5, p. 96, 1916 (Queensland coast).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 256, 1927 (Orani, Philippines).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 15, pl. 4, fig. 45a, 1927.—WHITLEY, Journ. Pan-Pacific Res. Inst., vol. 2, No. 1, p. 3, 1927 (Fiji).—JORDAN, Journ. Pan Pacific Inst., vol. 2, No. 4, p. 3, 1927 (Samoa).—FOWLER, Mem. Bishop Mus., vol. 10, p. 26, 1928 (Honolulu; Hilo).—MCCULLOCH, Austral. Mus. Mem. vol. 5, p. 34, 1929 (reference).—FOWLER, Mem. Bishop Mus., vol. 11, No. 5, p. 314, 1931 (Honolulu).—CHEVEY, Inst. Océanogr. Indochine, 19<sup>e</sup> note, p. 8, 1932 (Cochin China).—ROXAS, Philippine Journ. Sci., vol. 55, p. 238, pl. 1, fig. 11 (scale), 1934 (Manila).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 18, 1937 (reference).

*Elops hawaiiensis* FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines); No. 112, p. 82, 1922 (Hawaii); Bishop Mus. Bull. 22, p. 23, 1925 (Honolulu).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Manila; Capiz; Dumaguete).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 11, 1937 (Singapore).

Depth  $4\frac{1}{2}$  to  $5\frac{1}{4}$ ; head  $3\frac{1}{2}$  to 4, width  $2\frac{2}{5}$  to  $2\frac{2}{3}$ . Snout  $3\frac{5}{6}$  to  $4\frac{1}{3}$  in head from snout tip; eye  $4\frac{1}{8}$  to  $6\frac{1}{4}$ ,  $1\frac{1}{5}$  to  $1\frac{1}{3}$  in snout, little greater than interorbital in young to  $1\frac{1}{3}$  in interorbital with age, adipose lids broad; maxillary reaches well beyond eye, expansion  $1\frac{1}{2}$  to  $1\frac{3}{4}$  in eye, length  $1\frac{3}{4}$  to  $1\frac{7}{8}$  in head; teeth in finely villiform bands in jaws, small patch on vomer and wide areas on palatines and tongue; interorbital  $4\frac{1}{8}$  to  $5\frac{1}{2}$ , depressed or slightly concave, at least medially. Gill rakers 7 or 8+16 or 17, lanceolate, about  $1\frac{1}{2}$  in eye.

Scales 85 to 95 in lateral line to caudal base, 7 or 8 more on latter; 12 or 14 scales above, 9 or 10 below, 38 to 46 predorsal. Scales with 13 to 18 basal striae; circuli very fine, none apical.

D. v to viii, 17, 1 or 18 1, fifth to eighth simple ray  $1\frac{1}{2}$  to  $1\frac{2}{3}$  in total head length; A. iv or v, 11, 1 or 12, 1, fourth or fifth simple ray 2 to  $2\frac{3}{5}$ ; least depth of caudal peduncle 3 to  $3\frac{1}{8}$ ; pectoral  $1\frac{7}{8}$  to 2; ventral  $1\frac{1}{8}$  to 2; caudal  $3\frac{1}{2}$  in rest of body.

Back and head above brown, sides and below bright silvery white. Fins all pale brownish. Dorsal and caudal terminally with pale brownish, fins otherwise whitish. Iris silvery white.

Red Sea, Arabia, Zanzibar, Delagoa Bay, Natal, Cape of Good Hope, Mauritius, Réunion, Madagascar, India, Pinang, East Indies, Philippines, Hainan, China, Formosa, Japan, Korea, Queensland, New South Wales, Hawaii. Also in the tropical Atlantic. I feel obliged to consider the nominal species described by Regan as *Elops hawaiensis* and *Elops australis* as synonyms. Likewise his interpretation of *Elops machnata* breaks down upon a survey of the materials before me. The distinctions used in grouping *Elops machnata* and *Elops lacerta* with "mandible projects, covers front part of premaxillary band of teeth when mouth closes" will not hold, as various conditions occur. Thus in some specimens the mandible is shorter than the snout, or it may protrude, but never covers or conceals the premaxillary teeth, even with age. *Elops machnata* and *Elops lacerta* may hold on their fewer vertebrae 63 or 64, compared with 78 or 79 for the other species.

22346. Dampalit, near Malabon. August 10, 1908. Length, 135 mm. Lower gill rakers 14.
13186. Iloilo market. June 1, 1908. Length, 179 mm. Lower gill rakers 15. U.S.N.M. No. 8020. Hong Kong, China. William Stimpson. Length, 353 mm. Scales 84+7. Lower gill rakers 14.
- U.S.N.M. No. 47921. Port Jackson. Australian Museum. Length, 600 mm., caudal broken. Scales 87+7. Gills taken out.
- U.S.N.M. No. 51032. Hawaiian Islands. Bureau of Fisheries. Length, 273 mm. Scales 90+10. Lower gill rakers 13.
- U.S.N.M. No. 55455. Hawaiian Islands. U. S. Bureau of Fisheries. Length, 228-277 mm. Scales 83 to 86+9 or 10. Lower gill rakers 13 to 15. 3 examples.
- U.S.N.M. No. 59853. New South Wales. D. G. Stead. Length, 460-470 mm., caudals broken. Scales 89 to 93+10. Lower gill rakers 14 or 15. 2 examples.
- U.S.N.M. No. 71890. Okinawa, Riu Kiu. Albatross collection. Length, 288 mm. Scales 90+8. Lower gill rakers 15.
- U.S.N.M. No. 72485. Batavia, Java. Bryant and Palmer. Scales 93+9. Lower gill rakers 15.
- U.S.N.M. No. 72486. Batavia, Java. Bryant and Palmer. Scales 70+8. Lower gill rakers 15. Length 265 mm.
- U.S.N.M. No. 72487. Batavia, Java. Bryant and Palmer. Scales 82+8. Lower gill rakers 14. Length, 253 mm.
- U.S.N.M. No. 83103. Hilo, Hawaii. U. S. Exploring Expedition. Length, 735 mm.
- U.S.N.M. No. 83444. No locality. U. S. Exploring Expedition. Fins.
- A.N.S.P. No. 1181. Hawaiian Islands. Dr. W. H. Jones. Length, 266 mm.

### Family ALBULIDAE

Body elongated, belly flattened. Snout conic, conspicuous, partly quadrangular. Eye medial. Mouth inferior, bordered above for greater extent by premaxillaries, and only hind part of edentulous maxillaries. Villiform teeth in jaws, on vomer and palatines; coarse blunt teeth on pterygoids, sphenoid, and tongue. Lower jaw without

gular plate. Gill membranes widely separated, free. Pseudobranchiae present. Branchiostegals 12 to 16. Vertebrae about 70, of which 28 caudal. Air bladder large. Scales cycloid, brilliant silvery white. Head naked with few large scales forming occipital collar. Paired fins each with long scaly axillary flap. Lateral line complete. Dorsal moderate, before ventrals. No adipose fin. Anal very small, near caudal, far behind vent. Caudal deeply forked. Pectorals small, low. Ventrals small, rays 10 to 14.

World-wide in warm tropical seas, the species usually referred to *Albula*, though the West Indian *Dixonina* differing in the last dorsal and anal ray ending in an extended filament. The living *Albula* is also known from Eocene deposits and several other fossil genera have been referred to the family.

#### Genus ALBULA Scopoli

*Albula* GRONOW, Zoophylacii, p. 102, 1763. (Species nonbinomial. "Le type est le Butirin macrocephale (*Clupea macrocephala* Lacépède)" = *Esox vulpes* Linnaeus, designated by Desmarest, Encyclop. Hist. Nat., Chenu, vol. 19, p. 309, 1874.) (*Albula* Osbeck, Reise durch China, p. 309, 1762. Type, *Albula chinensis* Osbeck = *Salanx* Cuvier 1817. Inadmissible.)

*Albula* SCOPOLI, Introd. Nat. Hist., p. 454, 1777 (on Gronow). (Type, *Esox vulpes* Linnaeus.)

*Vulpis* CATESBY, Nat. Hist. Carolina, ed. 2, p. 1, 1771. (Type, *Esox vulpes* Linnaeus, tautotypic. Inadmissible.)

*Butyrinus* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 45, 1803. (Type, *Butyrinus bananus* Lacépède, monotypic.)

*Butyrinus* CUVIER, Règne animal, ed. 2, vol. 2, p. 329, 1829. (Type, *Butyrinus bananus* Lacépède.)

*Butyrinus* BLEEKER, Nat. Geneesk. Arch. Nederl.-Indie, vol. 2, p. 509, 1845. (Type, *Butyrinus bananus* Lacépède.)

*Buturinus* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 316, 1847. (Type, *Butyrinus bananus* Lacépède.)

*Glossodonta* CUVIER, Mem. Mus. Hist. Nat. Paris, vol. 1, p. 232, 1815. (Atypic.) (Type, *Argentina glossodonta* Forskål, assumed tautonym.)

*Glossodus* (Cuvier) AGASSIZ, Pisc. Brasil. Spix, p. 48, 1829. (Type, *Argentina glossodonta* Forskål.)

*Esunculus* KAUP, Cat. Apodal Fish. British Mus., p. 143, 1856. (Type, *Esunculus costei* Kaup.) (Larva.)

*Conorhynchos* (not Bleeker 1858) GILL, Cat. Fish. East Coast North America, p. 55, 1861. (Type, *Butyrinus vulpes* Storer.) (*Conorhynchos* Motschoulsky 1860 in Coleoptera precluded.)

*Atopichthys* GARMAN, Mem. Mus. Comp. Zool., vol. 24, p. 326, 1899. (Type *Atopichthys esunculus* Garman, designated by Jordan, Genera of Fishes, pt. 4, p. 486, 1920.)

Body little compressed. Head moderate. Snout piglike, overlaps mouth. Eye large, with bony ridge above. Annular adipose eyelid nearly covers eye. Mouth small, horizontal. Maxillary strong, simple, with one supplemental bone. Gill rakers short tubercles. Scales forming regular horizontal or longitudinal series parallel with

lateral line. Lateral line with simple tubes. Dorsal short, midway in body. Last dorsal and anal rays not extended. Pectorals short, folding like ventrals.

One species in all tropical seas, remarkable for its anatomical peculiarity in that the rudimentary conus arteriosus of the heart is furnished with two rows of valvules in place of one, though none of the ganoid fishes have less than three. Like related families, the young pass through larval stage, in which they are long, bandlike, transparent, and scaleless.

#### ALBULA VULPES (Linnaeus)

*Esox vulpes* LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 313, 1758 (type locality: Bahama Islands) (on *Bone fish* Catesby, Nat. Hist. Carolina, pl. 2, fig. 1, 1737, Bahamas); ed. 12, vol. 1, p. 516, 1766 (copied).

*Synodus vulpes* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 321, pl. 8, fig. 2, 1803 (no locality).

*Albula vulpes* JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 52, 1901 (reference).—JENKINS, Bull. U. S. Fish Comm., vol. 22, (1902), p. 432, 1903 (Honolulu).—SNYDER, Bull. U. S. Fish Comm., vol. 22, 1902, p. 521, 1904 (Hanalei Bay, Kauai).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, 1903, p. 55, 1905 (Honolulu; Hilo).—SEALE, Occ. Pap. Bishop Mus., vol. 4, No. 1, p. 5, 1906 (Tahiti).—OGILBY, Proc. Roy. Soc. Queensland, vol. 21, p. 87, 1908 (Moreton Bay).—KENDALL and GOLDSBOROUGH, Mem. Mus. Comp. Zool., vol. 26, p. 242, 1911 (Funafuti; Ellice Islands).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Kagoshima market).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 7, fig. 5, 1913 (Batavia).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 53, 1913 (Natal).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 293, 1917 (reference).—McCULLOCH, Rec. Australian Mus., vol. 12, No. 8, p. 172, 1919 (Sydney; Malekula, New Hebrides; Hood Bay, Papua).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 13, 1925 (reference).—FOWLER, Bishop Mus. Bull. 22, p. 4 (Guam) p. 23, 1925 (Honolulu).—FOWLER and BALL, Bishop Mus. Bull. 26, p. 5, 1925 (Lisiansky).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 106, 1925 (Natal coast).—FOWLER, Bishop Mus. Bull. No. 38, p. 5, 1927 (Christmas Island).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 15, pl. 4, fig. 47a, 1927.—FOWLER, Mem. Bishop Mus., vol. 10, p. 27, 1928 (Tahiti, Honolulu, Lisiansky, Guam, Funafuti, Society Islands).—McCULLOCH, Austral. Mus. Mem., vol. 5, p. 35, 1929 (reference).—FOWLER, op. cit., vol. 11, p. 315, 1931 (Honolulu).—CHEVEY, Inst. Océanogr. Indochine, 19° note, p. 8, 1922 (Cochin China).—HERRE, Fishes Herre Philippine Exped. 1931, p. 13, 1934 (Jolo).—ROXAS, Philippine Journ. Sci., vol. 55, p. 242, pl. 1, fig. 12 (scale), 1934 (Cadiz Nuevo, Negros; Mekong R.).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 67, fig. 1 (Sanoer, Bali), p. 410 (Durban), 1934.—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 12, 1935-36 (Mar Rosso).—FOWLER, Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 158, fig. 62, 1936 (West Indies).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser., vol. 21, p. 26, 1936 (New Hebrides).—WHITLEY, Rec. Austral. Mus., vol. 20, No. 1, p. 6, fig. 2 (larva), 1937 (New Hebrides).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 18, 1937 (reference).—FOWLER, List Flsh. Malaya, p. 22, 1938 (reference).

- Argentina glossodonta* FORSKÅL, Descript. Animal., pp. XIII, 68, 1775 (type locality: Djedda and Lohaja, Red Sea).—BONNATERRE, Tableau encyclop. Ichth., p. 177, 1788 (Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1394, 1789 (Red Sea).—WALBAUM, Artedi Pise., vol. 3, p. 45, 1792 (copied).—CUVIER, Mém. Mus. Hist. Nat. Paris, vol. 5, p. 371, 1819.
- Butirinus glossodontus* RÜPPELL, Neue Wirbelth., Fische, p. 80, pl. 20, fig. 3, 1835 (Djedda).—SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 242, pl. 109, fig. 3, 1846 (Japan; Korea).—GÜNTHER, Fishes of Zanzibar, p. 120, 1866 (Zanzibar).
- Butirinus glossodonta* LAY and BENNETT, Zool. Beechey's Voy., Fishes, p. 46, 1839 (Oahu).
- Elops glossodontus* SWAINSON, Nat. Hist. Animals, vol. 2, p. 292, 1839 (on Rüppell).
- Conorhynchus glossodon* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 83, pl. (12)270, fig. 1, 1866–72 (Java, Madura, Bali, Sumatra, Pinang, Banka, Biliton, Celebes, Obi Major, Saparua, Ceram, New Guinea); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 300, 1868 (Waigiu).
- Albula glossodonta* KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 602, 1871 (Red Sea).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 70, p. 513, 1901 (Honolulu).—OGILBY, Mem. Queensland Mus., vol. 5, p. 96, 1916 (Queensland Coast).
- Albula glossodon* GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 385, 1909 (Society and Hawaiian Islands).
- Esox argenteus* SCHNEIDER, Syst. Ichth. Bloch, p. 395, 1801 (type locality: Australia, New Zealand).—LICHENSTEIN, Deser. Anim. Forster, p. 196, 1844 (Tahiti), p. 256 (Tauna).
- Synodus argenteus* SCHNEIDER, Syst. Ichth. Bloch, p. 398, 1801 (no locality).
- Clupea brasiliensis* SCHNEIDER, Syst. Ichth. Bloch, p. 427, 1801 (type locality: Brazil).
- Albula conorynchus* SCHNEIDER, Syst. Ichth. Bloch, p. 432, 1801 (type locality: Antilles).
- Albula conorhynchus* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 356, 1846 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 468, 1868 (Port Natal, Cape Verde, West Indies, Jamaica, Puerto Cabello, Belize, Bahia, Pacific coast Central America, New Hebrides, Singapore, Ceylon, Zanzibar, Red Sea).—STREETS, U. S. Nat. Mus. Bull. 7, p. 76, 1877 (Honolulu).—SCHMELTZ, Cat. Mus. Godeffroy, No. 6, p. 18, 1877 (Samoa).—DAY, Fishes of India, pt. 4, p. 648, 1878.—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Samoa).—GÜNTHER, Rep. Voy. Challenger, vol. 1, p. 61, 1880 (Hilo).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 593, 1883 (New Guinea); vol. 8, p. 278, 1884 (Hood Bay, New Guinea).—KENT, Great Barrier Reef, p. 302, 1893 (north Queensland).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, p. 123, 1929 (Phuoc-tinh).
- Albula conorhyncus* GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 269, 1908 (Natal).
- Albula plumieri* SCHNEIDER, Syst. Ichth. Bloch, p. 432, pl. 86, 1801 (on above).
- Albula immaculata* SCHNEIDER, Syst. Ichth. Bloch, p. 451, 1801 (type locality: Central America).
- Butyrinus bananus* (Commerson) LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 46, 1803 (type locality: No. locality=Mauritius?).
- Albula bananus* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 345, 1846 (Mauritius).—GUICHENOT, Notes île Réunion, vol. 2, p. 29, 1863.—KNER, Reise Novara, Fische, p. 339, 1865 (Java).

- Argentina bonuk* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 365, 366, 1803 (type locality: Arabian Sea).
- Clupea macrocephala* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, 1803, pp. 426, 460, pl. 14, fig. 1, 1803 (type locality: Martinique).
- Glossodus forskalii* AGASSIZ, Pisc. Brasil. Spix, p. 49, 1829 (type locality: Bahia, Brazil).
- Engraulis sericus* (Spix) AGASSIZ, Pisc. Brasil. Spix, p. 49, pl. 23, fig. 2, 1829 (name in synonymy).
- Engraulis bahiensis* (Spix) AGASSIZ, Pisc. Brasil. Spix, p. 49, pl. 24, fig. 2, 1829 (type locality: Bahia).
- Albula parrae* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 245, 1846 (type locality: Martinique, Bahia; Rio Janeiro).
- Albula goreensis* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 248, 1846 (type locality: Goree, West Africa).
- Albula neoguinaica* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 253, 1846 (type locality: New Guinea).
- Albula seminuda* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 254, 1846 (type locality: New Guinea).
- Albula erythrocheilos* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 540, 1846 (type locality: Friendly Islands).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1265, 1849 (Pinang).
- Albula forsteri* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 256, 1846 (type locality: Tahiti).—THIOLLIÈRE, Fauna Woodlark, p. 207, 1857 (Woodlark Island).
- Albula rostrata* GRAY, Cat. fish Gronow, p. 189, 1854 (type locality: American Ocean, Indian and Mediterranean Seas).
- Albula virgata* JORDAN and JORDAN, Mem. Carnegie Mus., vol. 10, p. 6, pl. 1, fig. 1, 1922 (type locality: Honolulu and Hilo).

Depth 4 to  $5\frac{1}{4}$ ; head  $3\frac{1}{3}$  to  $3\frac{4}{5}$ , width  $1\frac{7}{8}$  to  $2\frac{3}{4}$ . Snout  $2\frac{1}{6}$  to 3 in head; eye  $4\frac{1}{8}$  to  $4\frac{7}{8}$ ,  $1\frac{1}{3}$  to 2 in snout, 1 to  $1\frac{1}{2}$  in interorbital, only narrow vertical aperture in adipose lid; maxillary not quite reaching eye, length  $2\frac{4}{5}$  to  $3\frac{1}{5}$  in head; teeth villiform, in bands in jaws, on vomer and palatines; interorbital 3 to 4, nearly level. Gill rakers VIII+VIII to XII, low tubercles.

Scales 69 or 70 in lateral line to caudal base and 6 or 7 more on latter; 9 scales above, 6 or 7 below, 23 to 28 predorsal. Scales with 3 basal radiating striae; circuli very fine.

D. IV or V, 14, I or 13, I, first branched ray  $1\frac{2}{5}$  to  $1\frac{3}{5}$  in head; A. III, 6, I, first branched ray  $2\frac{7}{8}$  to 4; least depth of caudal peduncle  $3\frac{1}{3}$  to  $3\frac{3}{5}$ ; pectoral  $1\frac{2}{3}$  to  $1\frac{3}{4}$ ; ventral  $2\frac{1}{8}$  to  $2\frac{1}{5}$ ; caudal  $3\frac{2}{5}$  to  $3\frac{2}{3}$  in rest of body.

Back gray-brown. Sometimes scale junctures on back show dark longitudinal streaks or lines above lateral line, all following within scale junctures. Sides and under surfaces bright or gleaming silvery white. Dorsal and caudal pale gray or brown, other fins whitish.

Red Sea, Zanzibar, Natal, Mauritius, India, Ceylon, Pinang, Singapore, East Indies, Japan, Korea, Queensland, New South Wales, Melanesia, Micronesia, Polynesia, Hawaii.

- 10789 to 10791, 13883. Matnog Bay, East Luzon. May 31, 1909. Length, 173–213 mm.  
U.S.N.M. No. 18004. Honolulu. Dr. T. H. Streets. Length, 500 mm.  
U.S.N.M. No. 52667. Hawaiian Islands. *Albatross* collection (03588). Length, 300 mm.  
U.S.N.M. No. 55133. Hanalei River, Hawaiian Islands. *Albatross* collection. Length, 198–205 mm. 2 examples.  
U.S.N.M. No. 65722. Funafuti. Bureau of Fisheries (08336). Length, 75 mm.  
A.N.S.P. No. 25997. Durban, Natal. 1927. H. W. Bell Marley. Length, 238 mm.

### Family OSTEOGLOSSIDAE

Body elongate, sides flattened and ventrally compressed. Mouth edge formed by premaxillaries and longer maxillaries. Teeth various. Subopercle much reduced, more or less concealed beneath preopercle. Gill openings wide. No pseudobranchiae. Branchiostegals 7 to 16. Stomach without blind sac. Pyloric coeca 2. No oviducts. Scales large to very large, cycloid, formed as mosaiclike. Head scaleless. Lateral line complete, with single tubes. Dorsal opposite anal, both approximated to rounded caudal. Pectorals low, folding against body. Ventral rays 5 or 6.

Fresh waters of South America, Africa, Indo-Australian Archipelago, and Australia. As here understood the family resolves into three subfamilies; the Osteoglossinae including the American *Osteoglossum* besides *Scleropages*; the American Arapaminae with *Arapamia*; the African Clupisudinae with *Clupisudis*, usually known by later *Heterotis*. The fossils *Phareodus* from the Wyoming Eocene and *Anogmius* from the Cretaceous of Kansas are evidently related forms. As Günther has shown, the distribution of the members of the family closely parallels that of the Dipnoi.

#### Genus SCLEROPAGES Günther

*Scleropages* GÜNTHER, Ann. Mag. Nat. Hist., ser. 3, vol. 14, p. 196, 1864. (Type, *Scleropages leichardti* GÜNTHER, monotypic.)

*Delsmania* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 243, 1934. (Type, *Osteoglossum formosum* Schlegel and Müller, orthotypic.)

Body compressed ventrally to trenchant edge. Mouth cleft very wide, greatly inclined. Lower jaw prominent, with pair of barbels at tip. Maxillary very long, narrow. Jaws with series of small teeth and villiform teeth on vomer, palatines, pterygoids and tongue. Gill membranes united at bases, free from isthmus. Gill rakers stout, few, with series of protuberances on inner side of first branchial arch. Branchiostegals 15 or 16. Scales large. Dorsal much shorter than anal. Dorsal and anal separated from caudal. Pectorals elongate.

Several species in the Indo-Malayan region.

## ANALYSIS OF SPECIES

- a<sup>1</sup>. DELSMANIA.* Scales 21 to 24 in lateral line, 2 or 3 above; pectoral 3 in combined head and body to caudal base----- *formosus*  
*a<sup>2</sup>. SCLEROPAGES.* Scales 34 to 39 in lateral line, 3 to 5 above; pectoral 3½ to 4¼ in combined head and body to caudal base.  
*b<sup>1</sup>.* Scales 3 or 4 above lateral lines; D. 20; A. 31; pectoral 4¼ in combined head and body to caudal base----- *leichardti*  
*b<sup>2</sup>.* Scales 4 or 5 above lateral line; D. 16 to 19; A. 27 to 29; pectoral 3¼ in combined head and body to caudal base----- *guntheri*

Subgenus *DELSMANIA* Fowler

Scales 21 to 24 in lateral line, 2 or 3 above. Pectoral 3 in combined head and body to caudal base.

*SCLEROPAGES FORMOSUS* (Schlegel and Müller)

*Osteoglossum formosum* SCHLEGEL and MÜLLER, Verh. Nat. Ges. Nederland. Zool., p. 1, pl. 1, 1829-41 (type locality: Borneo).—VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 225, 1846 (copied).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 145, pl. (18) 276, fig. 2, 1866-72 (Sumatra, Banka, Borneo).—GÜNTHER, Cat. Fishes British Mus., vol. 8, p. 378, 1870 (Borneo).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, pp. 304, 312, 404, 1876 (Danau, Sriang, Borneo).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 623, 1926 (Ludu, Borneo).

*Scleropages formosus* WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 13, fig. 7, 1913 (Palembang, Sumatra, Borneo).—H. M. SMITH, Copeia, 1931, p. 64 (Kratt).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 243, 1934 (reference); vol. 86, p. 335, 1934 (Kratt).—HARDENBERG, Treubia, vol. 14, livr. 3, p. 304, 1934 (Pulu Perdamaran, Rokan River mouth, Sumatra); vol. 15, livr. 3, p. 226, 1936 (Sungei Terentang, middle course Kapuas R., Borneo).—SUVATTI, Index Fish. Siam, p. 75, 1937 (Trat; Maenam Trat).—FOWLER, List Fish. Malaya, pp. 22, 246, 1938 (reference).

Depth 3½ nearly to 5; head 3½ to 4. Snout 4¾ in head; eye 4 to 4½, subequal with snout, 1½ in interorbital; maxillary reaches beyond eye, 1¾ in head; chin prominent, with 2 stout fleshy barbels, little shorter or longer than eye; interorbital rather low. Gill rakers 8, stout, ¼ shorter than gill filaments or ⅔ of eye.

Scales 21 to 24 in lateral line, of which last 1 or 2 on caudal base; 2 or 3 above, 3 below, about 21 predorsal. Scales large, with prominent, reticulated striae.

D. 20, origin over middle of anal base, height of fin 2⅓ in head; A. 26 or 27, height of fin 2½; caudal 1¾, hind edge convex; least depth of caudal peduncle 3½; pectoral 2⅞ in combined head and body to caudal base; ventral 1¾ in head.

Above dark olivaceous-green, sides and ventral surface silvery or golden green, sometimes with longitudinal rows of oblique dark patches, shining through lateral scales. Fin membranes bluish, rays reddish brown. Length, 430 mm. (Weber and Beaufort.)

East Indies. Buccal incubation has been noticed by Fuhrmann (1905).

Subgenus *SCLEROPAGES* Günther

Scales 34 to 39 in lateral line, 3 to 5 above. Pectoral  $3\frac{1}{2}$  to  $4\frac{1}{4}$  in combined head and body to caudal base.

*SCLEROPAGES LEICHARDTI* Günther

*Scleropages leichardti* GÜNTHER, Ann. Mag. Nat. Hist., ser. 3, vol. 14, p. 196, pl. 7, 1864 (type locality: Burdekin River and Princhester, 90 miles from Rockhampton, Queensland).—KENT, Proc. Roy. Soc. Queensland, vol. 8, pt. 2, p. 108, 1892 (eastern coastline of Queensland).—WEBER, Notes Leyden Mus., vol. 32, p. 226, pl. 3, 1910 (Digul River, Dutch New Guinea); Nova Guinea, vol. 9, p. 516, 1913 (copied).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 14, 1913 (copied).—FOWLER, Mem. Bishop Mus., vol. 10, p. 33, 1928 (compiled).—McCULLOCH, Austral. Mus. Mem., vol. 5, p. 36, 1929 (Queensland).

*Scleropages leichardtii* BANCROFT, Proc. Roy. Soc. Queensland, vol. 28, p. 93, 1916 (Dawson River).

*Scleropages leichhardti* McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).

*Osteoglossum leichardti* GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 378, 1868 (type).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 256, 1881 (Queensland Rivers).—KENT, Great Barrier Reef, p. 299, 1893 (Fitzroy, Dawson, and other intertropical Queensland rivers).

*Osteoglossum jardini* KENT, Proc. Roy. Soc. Queensland, vol. 8, No. 3, p. 105, 1892 (type locality: Batavia and Gregory Rivers, Cape York, Gulf of Carpentaria, Queensland).

*Osteoglossum jardinei* KENT, Great Barrier Reef, p. 300, 1893 (Batavia, Norman and Gregory Rivers).

*Scleropages jardini* BANCROFT, Proc. Roy. Soc. Queensland, vol. 28, p. 95, 1916 (Gregory River).

*Scleropages jardinei* McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).

Depth  $3\frac{3}{4}$ ; head  $3\frac{1}{4}$ . Snout  $7\frac{2}{5}$  in head from snout tip; eye  $7\frac{1}{5}$ , subequal with snout; maxillary reaches well beyond eye, length  $1\frac{1}{5}$  in head from upper jaw tip; lower jaw protudes, with pair of very small barbels near symphysis; series of small, close-set, conic teeth in each jaw and band of coarse cardiform teeth runs round palate; interorbital  $3\frac{3}{4}$  in head; broad suborbitals finely striate like opercle.

Scales 33 in lateral line to caudal base and 2 more on latter; 4 above, 5 below, about 28 predorsal. Scales very large, higher than long, minutely granulated; finely reticulate around larger median mesh.

D. 20, inserted slightly before middle of anal base, ninth ray 3 in total head length; A. 31, base nearly long as head, third ray  $3\frac{2}{5}$ ; caudal  $2\frac{1}{8}$ , convex behind; ventral  $3\frac{1}{2}$ ; pectoral  $1\frac{1}{4}$ , not quite reaching ventral,  $4\frac{1}{5}$  in combined head and body to caudal base.

Entire body finely dotted with brown. Vertical fins and opercular membrane with small whitish spots. Length 712 mm. (Günther.) Queensland.

## SCLEROPAGES GUNTHERI (Castelnau)

FIGURE 13

*Osteoglossum guntheri* CASTELNAU, Journ. Zool., Gervais, vol. 5, p. 131, 1876  
(type locality: Northeast Australia).

*Scleropages guntheri* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 220  
(labeled "New Zealand" though doubtless from Queensland).

*Scleropages guentheri* McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8,  
pt. 2, p. 131, 1925 (reference).—McCULLOCH, Austral. Mus., Mem., vol. 5,  
p. 36, 1929 (Queensland).

*Osteoglossum leichardti* (not Günther) KENT, Proc. Roy. Soc. Queensland, vol. 8,  
pt. 2, p. 108, 1892 (part).

Depth  $3\frac{1}{8}$  to  $4\frac{2}{5}$ ; head to hind opercle edge  $3\frac{1}{8}$  to  $4\frac{2}{5}$ , width  $2\frac{1}{5}$  to  $2\frac{1}{3}$ . Snout  $4\frac{1}{4}$  to 5 in head from snout tip; eye  $5\frac{1}{5}$  to  $6\frac{1}{5}$ ,  $1\frac{1}{3}$  in snout,  $1\frac{3}{4}$  in interorbital; maxillary reaches  $\frac{7}{8}$  in eye, expansion 2 in eye, length  $1\frac{3}{4}$  to  $1\frac{7}{8}$  in head from snout tip; con-

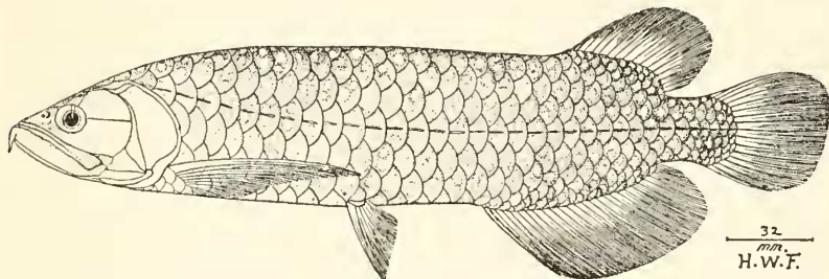


FIGURE 13.—*Seleropages guntheri* (Castelnau): Specimen from Queensland.

tinuous series of strong moderate-sized jaw teeth, laterally more or less concealed by tough thick lips; at snout tip 2 enlarged teeth, also each side little below or opposite nostrils 2 or 3 others; each side of mandibular symphysis 3 enlarged strong teeth and none more than twice size of others; vomer anteriorly with 3 transverse strong teeth, 5 smaller each side, also long area of small strong palatine teeth besides broad asperous pterygoid area; interorbital  $3\frac{2}{5}$  to  $3\frac{7}{8}$ , broadly convex, depressed. Gill rakers  $8+13$ , pointed, rather robust,  $1\frac{3}{4}$  in eye.

Scales 30 to 34 in lateral line to caudal base and 3 or 4 more on latter; 4 or 5 scales above lateral line, 4 to 6 below, 21 to 26 predorsal; exposures reticulated pattern on mosaic-like surface. Along anal base scales extend out from body and ensheathe bases of fin rays; caudal base scaly. Tubes short, simple, horizontal, median on scale exposures.

D. 16 to 19, twelfth ray  $1\frac{4}{5}$  in total head length; A. 27 to 29, sixth ray  $1\frac{2}{3}$ ; caudal  $1\frac{1}{4}$ ; least depth of caudal peduncle  $2\frac{7}{8}$ ; ventral  $1\frac{7}{8}$ ; pectoral  $3\frac{1}{2}$  in combined head and body to caudal base.

Largely dull brown, paler below and with leaden gray sheen. Each scale with 1 or 2 yellowish spots. Top of head brownish dusky, sides largely with silvery sheen. Fins dull brownish, membranes of dorsal, anal, and caudal mostly dusky.

Queensland.

13 examples. A.N.S.P. Queensland (wrongly labeled "New Zealand"). Dr. J. Haast. Length, 292-591 mm.

### Family CHANIDAE

Body oblong, compressed. Abdomen broad, rounded or flattened. Snout depressed. Eye completely covered with broad adipose lids. Mouth small, lower jaw with small symphyseal tubercle. Maxillary short, wide, excluded from mouth gape, without supplemental bone. Mandible overlapped by upper jaw. No teeth. Gill membranes broadly united, free from isthmus. Pseudobranchiae moderate and accessory branchial organ in cavity behind gill cavity. Branchiostegals 4, wide. Mucous membrane of oesophagus raised in spiral fold. Air bladder large. Intestine with many convolutions. Vertebrae 45. Scales small, firm, adherent, cycloid. Lateral line complete, tubes simple. Dorsal opposite ventral. Anal shorter than dorsal. Caudal long and deeply forked. Pectorals low. Ventral rays 10 to 12.

Large fishes of the Indo-Pacific. One living genus, besides several as fossils from European Cretaceous and Eocene deposits.

#### Genus CHANOS Lacépède

*Chanos* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 395, 1803. (Type, *Chanos arabicus* Lacépède, monotypic.)

*Lutodeira* VAN HASSELT, Algemeen Konst. Letterbode, p. 333, May 1823. (Type, *Lutodcira indica* Van Hasselt, monotypic).—VAN HASSELT, Bull. Sci. Nat. Féruccae, vol. 2, p. 92, 1824. (Type, *Lutodeira indica* Van Hasselt.)

*Lutodira* AGASSIZ, Nomencl. Zool. Index Univ., p. 217, 1846. (Type, *Lutodeira indica* Van Hasselt.)

*Scoliostomus* RÜPPELL, Atlas Reise Nördl. Afrika, Fische, p. 17, 1828. (Type, *Lutodeira indica* Van Hasselt.)

*Ptycholepis* (not Agassiz 1832) GRAY, in Dieffenbach, Travels in New Zealand, vol. 2, p. 218, 1842. (Type, *Mugil salmoneus* (Forster) Schneider.)

Body fusiform. Belly not keeled. Head depressed. Eye large. Mouth terminal, transverse. Upper edge of upper jaw formed by premaxillaries, with which front end of maxillary firmly joined. Gill rakers very fine and numerous. Scales silvery, rows arranged longitudinally. Head naked. Dorsal and anal with basal scaly sheaths. Lateral line with simple tubes. Caudal forked, long. Pectoral low. Ventral rays 10 to 12.

One species.

## CHANOS CHANOS (Forskål)

*Mugil chanos* FORSKÅL, Descript. Animal., pp. xiv, 74, 1775 (type locality: Djedda, Red Sea).—BONNATERRE, Tableau encyclop. Ichth., p. 180, 1788 (Red Sea).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1398, 1789 (Red Sea).—WALBAUM, Artedi Pisc., vol. 3, p. 22, 1792 (copied).—SCHNEIDER, Syst. Ichth. Bloch, p. 116, 1801 (Red Sea).

*Lutodcira chanos* RÜPPELL, Atlas Reise Nördl. Afrika, Fische, p. 18, pl. 5, figs. 1–2, 1828 (Red Sea); Neue Wirbelth., Fische, pp. 80, 84, 1835 (note).—GÜNTHER, Fishes of Zanzibar, p. 120, 1866 (Kiswarra Bay; Scy wholeles).

*Lutodera chanos* MARTENS, Verh. zool. bot. Ges. Wien, vol. 16, p. 379, 1866 (Gebel Fernjeh, Red Sea).

*Chanos chanos* KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 605, 1871 (Red Sea).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 70, p. 514, 1901 (Honolulu).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 52, 1901 (Riu Kiu).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 327, 1902 (Giran, Taihoku, Toii, Formosa).—JENKINS, Bull. U. S. Fish Comm., vol. 22, 1902, p. 432, 1904 (Honolulu).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 28, p. 124, 1904 (Honolulu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23 (1903), p. 56, fig. 10, 1905 (Moanalua, Honolulu).—JORDAN and SEALE, Bull. Bur. Fisheries, vol. 25, 1905, p. 186, 1906 (Samoa); vol. 26, 1906, p. 4, 1907 (Cavite).—EVERMANN and SEALE, Proc. U. S. Nat. Mus., vol. 31, p. 595, 1906 (Manila).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 622, fig. 3, 1906 (compiled).—JORDAN and STARKS, Proc. U. S. Nat. Mus., vol. 32, p. 491, 1907 (Okinawa).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 158, 1907 (Kalanskiye).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27 (1907), p. 226, 1908 (Manila).—SEALE, Philippine Journ. Sci. vol. A3, p. 519, 1908 (Philippines).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 166, 1909 (Giran, Taihoku, Toii).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 387, 1909 (New Caledonia, Samoa, Hawaii, Society Islands).—WAITE, Trans. New Zealand Inst., vol. 42, 1909, p. 381, 1910 (Norfolk Island).—FRANZ, Abh. Bayer Akad. Wiss., vol. 4, Suppl. vol. 1, p. 4, 1910 (Sagami Bay).—KENDALL and GOLDSBOROUGH, Mem. Mus. Comp. Zool., vol. 26, p. 243, 1911 (Makemo and Niau, Paumotus).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Batavia).—WEBER, Siboga Exped., Fische, vol. 57, p. 3, 1913 (Macassar and Gisser Island).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 15, fig. 8, 1913 (Krawang, Batavia).—OGILBY, Commercial Fish. Fisher. Queensland, p. 46, 1915 (Brisbane); Mem. Queensland Mus., vol. 5, p. 97, 1916 (Queensland).—CHAUDHURI, Mem. Indian Mus., vol. 5, p. 417, 1916.—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 298, 1917 (reference).—FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo, Mus. Vertebrata, p. 184, 1920 (Miyakojima).—FOWLER, Bishop Mus. Bull. 22, p. 23, 1925 (Honolulu).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 106, pl. 6, fig. 2, 1925 (Natal coast).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>o</sup> note, p. 7, 1926 (Gulf of Siam).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 17, pl. 5, fig. 7a, 1927.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 256, 1927 (Philippines, San Fernando, Vigan, Orani); Bishop Mus. Bull. 38, p. 5, 1927 (Fanning and Christmas Islands).—WHITLEY, Journ. Pan-Pacific Res. Inst., vol. 2, No. 1, p. 3, 1927 (Fiji).—HERRE, Philippine Journ. Sci., vol. 34, pp. 296,

303, 1927 (Lake Taal; Lake Naujan).—FOWLER, Mem. Bishop Mus., vol. 10, p. 28, pl. 1, 1928 (Honolulu, Oahu, Fiji, Nian, Makemo, New Guiana, Tuamotus).—MCCULLOCH, Austral. Mus. Mem., vol. 5, p. 42, 1929 (Queensland, New South Wales, New Zealand, Victoria).—HERRE and MINDOZA, Philippine Journ. Sci., vol. 38, No. 4, p. 451, pl. 1929.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 598, 1930 (Hong Kong).—SCHMIDT, Journ. Pan-Pacific Res. Inst., vol. 5, p. 3, 1930.—FOWLER, Hong Kong Nat., vol. 2, p. 51, fig. 3, 1931 (Hong Kong, East Indies, Polynesia, Hawaii); Mem. Bishop Mus., vol. 11, No. 5, p. 315, 1931 (Honolulu).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped., 1931, p. 13, 1934 (Bulacan; Malabon; Cavite; Capiz; La Paz; Dumaguete).—ROXAS, Philippine Journ. Sci., vol. 55, No. 3, p. 245, pl. 1, fig. 3 (scale), 1934 (Luzon; Panay; Bantayan; Mactan; Bohol; Palawan; Bungau).—TORTONESE, Boll. Mus. Zool. Anat. Comp. Torino, ser. 3, vol. 45, p. 13, 1935-36 (Massaua).—HERRE, Field Mus. Nat. Hist. Pub. 353, zool. ser. vol. 21, p. 27, 1936 (Marquesas; New Hebrides; Philippines; Java).—SUVATTI, Index Fish. Siam, p. 8, 1937 (Maenam Canthaburi; Khlong Lek; Samut Prakan; Ko Samet).—ROXAS and MARTIN, Dept. Agr. Comm. Manila, Tech. Bull. 6, p. 19, 1937 (reference).—FOWLER, List Fish. Malaya, p. 22, 1938 (reference).

*Mugil salmoninus* (Forster) SCHNEIDER, Syst. Ichth. Bloch, p. 421, 1801 (type locality: Pacific Ocean).—LICHENSTEIN, Descr. Animal. Forster, p. 299, 1844 (Tanna Island).

*Leuciscus (Ptycholepis) salmoninus* GRAY, in Dieffenbach's Travels in New Zealand, vol. 2, p. 218, 1842 (New Zealand).

*Lutodeira salmonea* RICHARDSON, Voy. Erebus and Terror, Fishes, p. 58, pl. 36, fig. 1, 1846 (Point Smith, Port Essington, Torres Straits).

*Chanos salmoninus* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 201, 1846 (between New Caledonia and Norfolk Island).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 81, pl. (14)272, fig. 4, 1866-72 (Java, Madura, Pinang, Celebes, Borneo).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 473, 1868 (Red Sea, Zanzibar, Seychelles, Pinang, Formosa, Cape York, Port Essington, type of *Leuciscus zeylonicus*).—HECTOR, Colonial Mus. Governm. Surv. Dept. (Fishes New Zealand), p. 64 (compiled), p. 120, pl. 11, fig. 101, 1872 (copied).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Manila).—BLEEKER, Arch. Néerland. Sci. Nat., vol. 13, p. 38, 1878 (New Guinea).—DAY, Fishes of India, pt. 4, p. 651, pl. 166, fig. 2, 1878 (South Canara).—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 59, 1879 (South Seas).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 383, 1880 (Port Jackson, north coasts Australia, Fiji).—GÜNTHER, Rep. Voy. Challenger, vol. 1, p. 61, 1880 (Honolulu).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 262, 1881 (Port Jackson; northern coast); vol. 7, p. 594, 1883 (New Guinea); vol. 8, p. 210, 1883 (Lower Burdekin River).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (South Seas).—OGILBY, Cat. Fishes New South Wales, p. 57, 1886.—VAILLANT, Bull. Soc. Philom. Paris, ser. 7, vol. 11, p. 53, 1886-87 (Tahiti).—BOULENGER, Proc. Zool. Soc. London, p. 666, 1887 (Muscat).—KENT, Great Barrier Reef, pp. 302, 370, pl. 46, fig., 1893.—WEBER, Zool. Nederland, Ost. Ind., vol. 3, p. 427, 1894 (Batavia).—ELERA, Cat. Fauna Filip., vol. 1, p. 585, 1895 (Luzon, Estanques de Malabon, Manila).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 7, 1897.—KENT, Naturalist in Australia, p. 175, 1897.—REGAN, Fauna Geogr. Maldives and Laccadive Arch., Gardner, vol. 1, p. 280, 1903 (lake, Kendikolu, Miladumadulu Atoll); Trans. Linn. Soc. London, ser. 2, vol. 12, Zool., pt. 1, p. 219, 1907 (Chagos Archipelago, Diego Garcia).—

- GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 271, 1908-11 (Natal).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 54, 1913 (Natal).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 356, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, p. 123, 1929 (Hué, Cochinchina).
- Chanos salmonoides* GÜNTHER, Philos. Trans. Roy. Soc. London, vol. 168, p. 471, 1879 (Rodriguez).
- Chanos arabicus* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 395, 396, 1803 (type locality: Arabia).—VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 187, 1846 (Mohila and Djedda).
- Lutodeira indica* VAN HASSELT, Algemeen Konst. Letterbode, p. 333, 1823 (type locality: Java).
- Cyprinus tolo* CUVIER, Règne animal, ed. 2, vol. 2, p. 276, 1829 (on *Tooleloo* Russell, Fishes of Coromandel, vol. 2, p. 85, pl. 208, 1803, type locality: Vizagapatam).
- Cyprinus pala* CUVIER, Règne animal, ed. 2, vol. 2, p. 276, 1829 (on *Palah bontah* Russell, Fishes of Coromandel, vol. 2, p. 84, pl. 207, 1803, type locality: Vizagapatam).
- Chanos pala* CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1260, 1849 (Pinang; Malay Peninsula).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 144, 1851.—DAY, Fishes of Malabar, p. 224, 1865 (Cochin, Malabar).
- Leuciscus zeylonicus* BENNETT, Proc. Zool. Soc. London, p. 184, 1832 (type locality: Ceylon).
- Mugil lavaretoides* (Solander) VALENCIENNES, Hist. Nat. Poiss., vol. 11, p. 489, 1836 (type locality: Mer du Sud) (name in text).—RICHARDSON, Ann. Mag. Nat. Hist., vol. 11, p. 489, 1843 (Tolaga).—VALENCIENNES, Hist. Nat. Poiss., vol. 18, p. 187, 1846 (reference).
- Chanos cyprinella* EYDOUX and SOULEYET, Voy. Bonite, Zool., vol. 1, p. 196, 1841 (type locality: Hawaiian Islands).—VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 198, 1846 (Honolulu).
- Chanos orientalis* EYDOUX and SOULEYET, Voy. Bonite, Zool., vol. 1, p. 196, pl. 7, fig. 1, 1841 (type locality: Hawaiian Islands). (Name in synonymy.)
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- Chanos mento* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 194, 1846 (type locality: Mauritius).
- Chanos chloropterus* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 195, 1846 (type locality: Madeopan, India).—KNER, Reise Novara, Fische, p. 341, 1865 (Java and Tahiti).
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- Chanos nuchalis* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 196, 1846 (on *Palah bontah* Russell).
- Chanos lubina* VALENCIENNES, Hist. Nat. Poiss., vol. 19, p. 199, pl. 567, 1846 (type locality: Buru, Seychelles, Mauritius).—GUICHENOT, Notes ile Réunion, vol. 2, p. 29, 1863.—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 82, 1866-72 (compiled).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 474, 1868 (compiled).
- Buterinus maderaspatensis* JERDON, Madras Journ. Lit. Sci., vol. 15, p. 344, 1849 (type locality: Madras).

*Chanos mossambicus* PETERS, Monatsb. Akad. Wiss. Berlin, p. 684, 1852 (type locality: Mozambique).—MARTENS, in von der Decken's Reise Ost Afrika, vol. 3, pt. 1, p. 144, 1869 (Kisanga).

*Lutodira mossambica* PETERS, Arch. Naturg., 1855, p. 268 (Mozambique).

*Chanos gardineri* REGAN, Fauna Geogr. Maldive and Laccadive Archi., Gardner, vol. 1, p. 280, 1903 (type locality: North Pool of Hulule Island, Male Atoll).

Depth  $3\frac{1}{2}$  to  $4\frac{3}{4}$ ; head  $3\frac{1}{4}$  to  $4\frac{1}{2}$ , width  $1\frac{4}{5}$  to  $2\frac{1}{8}$ . Snout  $3\frac{1}{5}$  to 4 in head; eye  $3\frac{1}{2}$  to 7, greater than snout,  $1\frac{1}{4}$  to  $1\frac{2}{5}$  in interorbital, covered with large adipose lids; maxillary not quite reaching eye, length 4 to  $4\frac{1}{4}$  in head; interorbital  $2\frac{2}{5}$  to  $3\frac{1}{8}$ , low or only slightly convex. Gill rakers 147 to  $160+107$  to 165, fine, extremely slender,  $2\frac{1}{2}$  to 3 in gill filaments.

Scales 78 to 80 in lateral line to caudal base and 8 to 11 more on latter; 12 or 13 scales above, 9 to 11 below, 30 to 46 predorsal. Scales with 31 to 51 horizontal parallel striae, ending in slender points; basal notch well developed, with rather coarse circuli 12 to 15 or fine.

D. IV to VI, 9, I to 12, I, fourth to sixth ray  $1\frac{1}{4}$  to  $1\frac{2}{5}$  in total head length; A. III, 6, I to 8, I, third simple ray  $3\frac{1}{8}$  to  $3\frac{3}{4}$ ; least depth of caudal peduncle  $2\frac{1}{2}$  to 3; pectoral  $1\frac{2}{5}$  to  $1\frac{2}{3}$ ; ventral  $1\frac{3}{4}$  to  $2\frac{1}{8}$ ; caudal  $2\frac{3}{4}$  to  $3\frac{1}{8}$  in rest of body.

Dull olive-brown, paler to whitish brown. Sides and under surfaces bright silvery white. Dorsal and caudal pale brownish to grayish, also pectoral above, fins otherwise whitish.

Red Sea, Arabia, Zanzibar, Mozambique, Natal, Mauritius, Rodriguez, Seychelles, Chagos Archipelago, Maldives, Laccadives, India, Ceylon, Malay Peninsula, Pinang, East Indies, Philippines, China, Formosa, Japan, West Australia, Northern Territory, Queensland, New South Wales, Norfolk Island, New Zealand, Melanesia, Polynesia, Hawaii. In life the coloration is dark gray, greenish or neutral above, silvery white below and dorsal, caudal and anal fins dusky terminally.

18369, 18370. Caloocan, Manila, Luzon. August 12, 1908. Length, 89–189 mm.  
19485 to 19488. Port Matalvi, Luzon. November 23, 1908. Length, 133–186 mm.

2 examples. Nabatas, Luzon—fish ponds and Malabon River, from Malabon. July 12, 1908. Length, 75–88 mm.

7 examples. Bangao plant in Palatikin 100 x 120. May 29, 1905. Caught August 8, 1908. Length, 64–83 mm.

U.S.N.M. No. 20861. Hawaiian Islands. B. B. Redding. (Introduced in California.) 3 examples.

U.S.N.M. No. 30601. New Guinea. Australian Museum. Length, 163 mm.

U.S.N.M. No. 30612. New Guinea. Australian Museum. Length, 156 mm.

U.S.N.M. No. 49282. Red Sea. Milan Museum. Length, 315 mm.

U.S.N.M. No. 51066. Hawaiian Islands. U. S. Fish Commission (04013, 03177). Length, 215–280 mm. 2 examples.

U.S.N.M. No. 52349. Samoa. Bureau of Fisheries. Length, 331 mm.

U.S.N.M. No. 55551. Hawaiian Islands. Bureau of Fisheries. Length, 303–305 mm. 2 examples.

- U.S.N.M. No. 55602. Manila. Dr. E. A. Mearns. Length, 145 mm.  
 U.S.N.M. No. 56334. Cavite, Luzon. G. A. Lung. Length, 277 mm.  
 U.S.N.M. No. 58039. Zamboanga. Dr. E. A. Mearns. Length, 310-315 mm. 2 examples.  
 U.S.N.M. No. 61667. Honolulu. C. L. Berndt. Length, 225 mm., deformed example with body abnormally short. Depth 2½.  
 U.S.N.M. No. 65798. Niau Island, Paumotus. *Albatross* collection. July 16, 1890. Length, 240 mm., caudal tips broken. Back with steel blue or blue-green reflections, under surface whitish.  
 U.S.N.M. No. 65799. Makemo, Paumotus. *Albatross* collection. Length, 210 mm. 2 examples. Back with blue-green reflections, otherwise largely silvery white.  
 U.S.N.M. No. 72273. Manila market. R. C. McGregor. Length, 310 mm.  
 U.S.N.M. No. 72492. Batavia, Java. 1909. Bryant and Palmer. Length, 303 mm.  
 U.S.N.M. No. 72493. Batavia, Java. Bryant and Palmer. Length, 220 mm., caudal tips broken.  
 U.S.N.M. No. 82799. Fiji. U. S. Exploring Expedition. Length, 120 mm.  
 U.S.N.M. No. 82895. Oahu. U. S. Exploring Expedition. Length, 160 mm.  
 U.S.N.M. No. 83443. No locality. U. S. Exploring Expedition. Head, 45 mm. long.

### Family PTEROTHRISSIDAE

Body oblong, elongate, belly rounded. Head narrow, oblong. Eye large. Mouth narrow, upper jaw edge formed by premaxillaries mesially and maxillaries laterally. Teeth minute, imbedded in thick lips. Opercular apparatus complete. Gill openings wide. Pseudobranchiae present. Stomach with blind sac. Pyloric coeca numerous. Air bladder with thick walls, ends in 2 short horns in front, pointed behind. Head naked. Lateral line present. Dorsal long, with numerous rays, little higher in front. Anal very small, posterior. Caudal forked. Pectoral low.

One living genus, also as fossil *Istieus* Agassiz from the Cretaceous of Europe and Syria.

#### Genus PTEROTHRISSUS Hilgendorf

*Pterothrissus* HILGENDORF, Act. Soc. Leopoldina Carol., pt. 13, p. 127, 1877.  
 (Type, *Pterothrissus gissu* Hilgendorf, monotypic.)

*Bathythrissa* GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 20, p. 443, 1877. (Type, *Bathythrissa dorsalis* Günther, monotypic.)

Body rather slender, tapers gradually back from front of dorsal to small slender caudal peduncle. Head large, with well-developed mucous cavities on cheek. Snout long, conic, end blunt, projects beyond mouth, with median ridge above. Eye median, high. Mouth small, subterminally inferior. Maxillary with marginal row of very small teeth. Orbital ridges project above sides of interorbital space. Gill membranes united. Gill rakers short, stout, papillate or tuber-

culate. Scales small, cycloid, deciduous. Caudal finely scaly over greater portion from base. Pyloric coeca 14. Vent near last fifth of body without caudal. Dorsal length half of body without caudal. Pectorals longer than ventrals, latter less than half of head and inserted midway between gill opening and anal origin.

One species.

**PTEROTHRISSESS GISSU Hilgendorf**

*Pterothrissus gissu* HILGENDORF, Act. Soc. Leopoldina Carol., pt. 13, p. 127, 1877

(type locality: off Tokyo).—JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 349 (Tokyo), p. 743, 1900 (Hakodate).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 52, 1901 (reference).—JORDAN and STARKS, Bull. U. S. Fish Comm., vol. 22, p. 578, 1902 (Matsushima and Suruga Bay).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 618, 1906 (Suruga Bay, Matsushima Bay, Tsuruga Straits, Hakodate).—FRANZ, Abh. Bayer. Akad. Wiss., vol. 4, suppl. vol. 1, p. 4, 1910 (Aburatsubo).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Tokyo market).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 119, 1925 (Shizuka and Yokohama markets).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 17, 1931 (Tokyo).—TANAKA, Jap. Fish. Life Colours, No. 40, 1933.

*Bathythrissa dorsalis* GÜNTHER, Ann. Mag. Nat. Hist., ser. 4, vol. 20, p. 443, 1877 (type locality: off Inosima, Japan); Rep. Voy. Challenger, vol. 22, p. 222, pl. 56, fig. A, 1887 (type, from 345 fathoms depth).

Depth 5 to  $7\frac{1}{2}$ ; head  $3\frac{1}{2}$  to 4, width 2 to  $3\frac{2}{5}$ . Snout  $2\frac{3}{4}$  to 3 in head; eye 3 to  $4\frac{1}{8}$ , 1 to  $1\frac{3}{5}$  in snout, greater than interorbital; maxillary reaches  $\frac{3}{5}$  to  $\frac{4}{5}$  to eye, expansion 2 to  $2\frac{3}{4}$  in eye, length  $3\frac{1}{4}$  to  $4\frac{3}{4}$  in head; teeth fine, conic, short, in rather broad bands in jaws; palate edentulous; interorbital  $4\frac{3}{4}$  to  $5\frac{7}{8}$ , low, medianly depressed. Gill rakers 3+11, short, spinescent tubercles,  $\frac{1}{3}$  of gill filaments which  $\frac{1}{2}$  in eye.

Scales 100 to 104 in lateral line to caudal base and 9 or 10 more on latter; 8 or 9 above, 6 or 7 below, 20 to 22 predorsal. Scales with 7 basal radiating striae; circuli fine, none apical.

D. III to V, 51, I to 53, I, first branched ray  $2\frac{1}{10}$  to  $2\frac{3}{5}$  in head; A. III, 9, I, first branched ray  $2\frac{3}{4}$  to  $3\frac{7}{8}$ ; caudal  $1\frac{2}{7}$  to  $1\frac{2}{3}$ , deeply forked, lobes broad; least depth of caudal peduncle 4 to  $4\frac{1}{8}$ ; pectoral  $1\frac{2}{3}$  to  $1\frac{3}{4}$ ; ventral  $2\frac{1}{8}$  to  $2\frac{1}{2}$ .

Brownish above, below silvery minutely dotted with brown. Alcoholic specimens only paler below as scales have fallen.

Coasts of Japan, in deep water. Günther's fish was only 384 mm. in length.

U.S.N.M. No. 51414. Matsushima, Japan. *Albatross* collection. Length, 74–95 mm. 5 examples.

U.S.N.M. No. 51449. Matsushima, Japan. *Albatross* collection. June 5, 1900. Length, 175–249 mm. 4 examples.

U.S.N.M. No. 57548. Tsushima, Japan. P. L. Jouy. Length, 366 mm.

U.S.N.M. No. 61664. Tokyo. Bureau of Fisheries (2353). Length, 490 mm.

U.S.N.M. No. 71378. Tokyo market. Bureau of Fisheries. Length, 473 mm.

## Family NOTOPTERIDAE

Body greatly compressed, caudal region very long, tapering. Head compressed. Upper jaw edge formed by premaxillaries and maxillaries, latter more developed. Parietals separate supraoccipital from frontal bones. Large hole on each side of skull between squamosal, exoccipital, and epiotic. No subopercle. Interopercle small, hidden under preopercle. No barbels. No pseudobranchiae or pharyngeal teeth. Air bladder divided in interior, communicates with ear. Stomach without blind sac. Pyloric coeca 2. No oviducts. Ribs sessile, accessory bones (adpleurals) attached to ends of front ribs or even fused, embraced by double ventral serratures. Precaudal vertebrae with transverse processes before ribs. Head and body densely scaled. Dorsal short, when present on caudal part of vertebral column. Anal very long. Pectoral depressed against sides.

Two genera, living in fresh or brackish water, chiefly in swamps or lagoons of southeast Asia and tropical Africa. The fishes of this family may be readily known by the extraordinarily long based anal, usually confluent with the small caudal fin.

## Genus NOTOPTERUS Lacépède

*Notopterus* LACÉPÈDE, Hist. Nat. Poiss., vol. 2, p. 189, 1800. (Type, *Notopterus kapirat* Lacépède = *Gymnotus notopterus* Pallas, virtually tautotypic.)  
*Chitala* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 244, 1934. (Type, *Mystus chitala* Buchanan-Hamilton, orthotypic.)

Body elongated, strongly compressed. Snout obtuse, convex. Mouth large or moderate, cleft lateral. Small teeth on premaxillaries, maxillaries, vomer, palatines, pterygoids, and tongue. Front nostril with tentacle, hind one near eye. Bones of head cavernous, lower preopercle edge serrated. Gill membranes partly united. Branchiostegals 6 to 9.

## ANALYSIS OF SPECIES

- a<sup>1</sup>. CHITALA.* Opercular scales not larger than those on body; 12 to 22 transverse rows of scales on preopercle; 37 to 45 pairs of abdominal scutes.  
*b<sup>1</sup>.* Maxillary reaches far behind eye; 20 to 22 transverse rows of scales on preopercle----- *chitala*
- b<sup>2</sup>.* Maxillary reaches hind border of eye or little beyond; 12 to 16 transverse rows of scales on preopercle----- *borneensis*
- a<sup>2</sup>. NOTOPTERUS.* Opercular scales much larger than those on body; 8 to 10 transverse rows of scales on preopercle; 28 to 33 pairs of abdominal scutes; maxillary reaches hind pupil or eye edge----- *notopterus*

## Subgenus CHITALA Fowler

Opercular scales not larger than those on body. Preopercle with 10 to 22 transverse rows of scales. Abdominal scutes 37 to 45.

## NOTOPTERUS CHITALA (Buchanan-Hamilton)

*Mystus chitala* BUCHANAN-HAMILTON, Fishes of Ganges, pp. 236, 382, 1822 (type locality: Bengal and Bebar Rivers).—GRAY, Illustr. Indian Zool., Hardwicke, vol. 1, pl. 91, fig. 1, 1832 (plate missing in Academy copy).

*Notopterus chitala* GRAY, Zool. Misc., p. 16, 1831 (Indian Seas).—BLEEKER, Ver-slag. Kon. Akad. Wet. Amsterdam, vol. 16, p. 356, 1864 (Siam); Nederland. Tijdschr. Dierk., vol. 2, p. 176, 1865; Atlas Ichth. Ind. Néerland., vol. 6, p. 147, pl. (16) 274, fig. 2, pl. (17) 275, fig. 2, 1866–72 (Java, Sumatra, Borneo, Bengal).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 479, 1868 (East India, Siam, types of *Notopterus lopis* and *Notopterus hypselonotus*).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Sintang in Borneo).—DAY, Fishes of India, pt. 4, p. 654, pl. 159, fig. 5, 1878 (Sind, Lower Bengal, Orissa, Assam, Burma, Siam).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 187, 1904 (Kuala Lipis).—POPTA, Notes Leyden Mus., vol. 27, p. 209, 1906 (Upper Mahakam, Borneo).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (without locality).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 10, fig. 6, 1913 (Sahilan, Djambi, Nias, Djonkong).—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, No. 2, p. 175, 1923 (Nontaburi).—VIPULYA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 227, 1923 (Bangkok).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>e</sup> Note, p. 7, 1926 (Cambodia; Cochinchina).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> Note, p. 124, 1929 (Cochinchina).—BORODIN, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Saigon).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 90, 1935 (Bangkok; Paknam).—HARDENBERG, Treubia, vol. 15, livr. 3, p. 226, 1936 (Pontianak; middle course of Kapuas R., Borneo).—SUWATTI, Index Fish. Siam, p. 18, 1937 (Bung Baraphet; Samrong Canal; Ban Pho; Suphanburi River).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 14, 1937 (Chandra Dam, Perak).—FOWLER, List Fish. Malaya, p. 23, 1938 (reference).

*Notopterus ornatus* GRAY, Zool. Misc., p. 16, 1831 (type locality: Indian Seas).

*Notopterus maculatus* VALENCIENNES, Voy. Ind. Orient. Belanger, Zool., p. 396, pl. 5, fig. 2, 1834 (type locality: India).

*Notopterus buchanani* VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 108, 1848 (type locality: Calcutta, Bengal).

*Notopterus lopis* BLEEKER, Nat. Geneesk. Arch. Nederl.-Indië, vol. 2, p. 510, 1845 (type locality: Batavia); Atlas Ichth. Ind. Néerland., vol. 6, pl. (17) 275, fig. 2, 1866–72.

*Notopterus hypselonotus* BLEEKER, Verh. Batav. Genootsch. (Chiroc.), vol. 24, p. 27, 1852 (type locality: Mussi River, Palembang, Sumatra).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (16) 274, fig. 2, 1866–72.

Depth 4; head  $4\frac{4}{5}$ . Snout 7 in head; eye  $7\frac{4}{5}$ , trifle before first fifth in head, slightly less than snout; maxillary reaches well behind eye, expansion  $1\frac{2}{5}$  in eye, length  $2\frac{3}{5}$  in head; teeth uniserial, along front of each jaw edge; row of palatine teeth, little enlarged in front; interorbital  $9\frac{2}{3}$ , little convex; lower preopercle edge minutely serrate.

Scales about 135 ? tubular (damaged) in lateral line; scales about 200 in lateral line to caudal base and 10 more on latter; 21 above, 37 below, about 165 predorsal scales. Scales cycloid, crowded and

smaller along body edges, very minute and numerous over most all of anal and caudal. Cheek with 16 series of scales over greatest extent. Ventral scutes about 50.

D. II, 5, I, origin more than eye diameter nearer caudal base than hind eye edge, length  $2\frac{1}{3}$  in head; caudal little less than greatest anal depth; A. V, 122 (not including lower undefined half of caudal) and upper lobe contains about 7 more; pectoral II, 12, small (damaged); rudimentary ventral close before anal.

Brown, with silver-gray tint, mostly uniform, immaculate; fins pale.

India, Burma, Siam, Java, Sumatra, Nias, Borneo.

1 example. A.N.S.P. No locality. Dried skin, 450 mm.

#### NOTOPTERUS BORNEENSIS Bleeker

*Notopterus borneensis* BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 2, p. (417) 437, 1851 (type locality: Sambas, West Borneo).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 479, 1868 (type; type of *Notopterus maculosus*).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 147, pl. (17) 275, fig. 1, 1866–72 (Sumatra and Borneo).—VOLZ, Zool. Jahrb., abth. syst., vol. 19, p. 410, 1904 (Benakat, Sumatra).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 489 (Baram, Borneo).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 11, 1913 (compiled).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 624, 1926 (Lundu River, Borneo).

*Notopterus maculosus* BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 2, pp. 417, 438, 1851 (type locality: Sambas, West Borneo).

Depth  $3\frac{2}{3}$  to 4; head  $4\frac{3}{4}$  to 5. Eye  $4\frac{3}{5}$  to 5 in head, longer than snout; maxillary reaches hind edge of eye or little beyond, length  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in head; lower suborbital edge and lower border and ridge on preopercle slightly serrated. Gill rakers?

Scales about 75 transversely from anal origin; scales on opercles not larger than on body, 12 to 16 transverse rows on preopercle; double series of 37 to 41 spines along abdomen.

D. 9 or 10; origin about midway between snout and caudal base in young, with age midway between eye and caudal base; A. 112 to 124; pectoral long as or shorter than postorbital part of head, rays 16 or 17; ventral 4 or 5.

Grayish silvery, back darker. Anal and caudal margined with brown. Axil of pectorals sometimes brown. Sides of body, anal and caudal sometimes with smaller or larger brownish spots. Length, 430 mm. (Weber and Beaufort.)

Sumatra, Borneo.

#### Subgenus NOTOPTERUS Lacépède

Opercular scales much larger than those on body. Preopercle with 8 to 10 transverse rows of scales.

## NOTOPTERUS NOTOPTERUS (Pallas)

*Gymnotus notopterus* PALLAS, Spicil. Zool., vol. 7, p. 40, pl. 6, fig. 2, 1769 (type locality: Indian Ocean).—BONNATERRE, Tableau encyclop. Ichth., p. 37, pl. 25, fig. 83, 1788 (seas of Asia).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1139, 1789 (Amboina).—WALBAUM, Artedi Pisc., vol. 3, p. 166, 1792 (copied).—FORSTER, Fauna Indica, p. 14, 1795.

*Notopterus notopterus* WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 9, 1913 (Batavia, Java).—HORA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 175, 1923 (Nontaburi).—VIPULA, Journ. Nat. Hist. Soc. Siam, vol. 6, p. 226, 1923 (Bangkok).—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 482, 1924 (Tale Sap, Inner Lake).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>o</sup> note, p. 7, 1926 (Cambodia; Cochinchina).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 85, 1934 (Chieng Mai; Bangkok); vol. 87, p. 90, 1935 (Bangkok); vol. 89, p. 130, 1937 (Bangkok; Paknam; Tachin).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 14, 1937 (Lake Chiñi, Pahang).—SUVATTI, Index Fish. Siam, p. 18, 1937 (Ayuthaya; Canthaburi; Khlong Sok; Mae-Nga).—FOWLER, List Fish. Malaya, p. 23 (246), 1938 (reference).

*Notopterus kapirat* LACÉPÈDE, Hist. Nat. Poiss., vol. 2, p. 190, 1800 (type locality: Amboina).—GRAY, Zool. Misc., p. 16, 1831 (Indian Seas).—VALENCIENNES, Voy. Ind. Orient. Belanger, Zool., p. 39, pl. 5, fig. 1, 1834 (tanks of Bengal).—RICHARDSON, Ichth. China Japan, p. 309, 1846 (compiled).—JERDON, Madras Journ. Lit. Sci., vol. 15, p. 343, 1849.—BLEEKER, Nova Acta Acad. Caes. Leop. Carol. Naturae Curios, vol. 24, pt. 1, p. 55, pl. 6, 1854; Nederland. Tijdschr. Dierk., vol. 2, pp. 35, 176, 1865 (Siam); Atlas Ichth. Ind. Néerland., vol. 6, p. 146, pl. (18) 276, fig. 1, 1866–72 (Java, Sumatra, Celebes, Bengal).—GÜNTHER, Cat. Fish. British Mus., vol. 7, p. 480, 1868 (Madras, Nilgherries, Dekkan, Loodianali, Poonah, Calcutta, Bengal, Assam, Cachar, Siam, East India, East Indies).—DAY, Fishes of India, pt. 4, p. 653, pl. 159, fig. 4, 1878 (India).—KÁROLI, Termesz. Flüzetek, Budapest, vol. 5, p. 184, 1881 (Siam).—SAUVAGE, Bull. Soc. Philom. Paris, ser. 7, vol. 7, p. 152, 1883 (Menam).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 9, 1889, p. 355, 1890 (Rangoon, Mandalay, Kokarit).—WEBER, Zool. Nederland. Ost Ind., vol. 3, p. 427, 1894 (Batavia).—DUNCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 187, 1904 (Kuala Semantan).—LLOYD, Rec. Indian Mus., vol. 1, p. 222, 1907 (Akyab).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 9, 1913 (Batavia).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>o</sup> note, pp. 31, 124, 174, 1929 (Thudoumot).—BORODIN, Bull. Vanderbilt Marine Mus., vol. 1, art. 2, p. 42, 1930 (Saigon).

*Mystus kapirat* BUCHANAN-HAMILTON, Fishes of Ganges, pp. 235, 382, 1822 (ponds and rivers of fresh water of Bengal).—GRAY, Illustr. Indian Zool. Hardwicke, vol. 1, pl. 91, 1832 (plate missing in Academy copy).

*Clupea synura* SCHNEIDER, Syst. Ichth. Bloch, p. 426, 1801 (type locality: Malabar; China).

*Mystus badgee* SYKES, Trans. Zool. Soc. London, vol. 2, p. 376, pl. 67, fig. 2, 1838 (type locality: Poona, Seedataik).

*Notopterus pallasi* VALENCIENNES, Hist. Nat. Poiss., vol. 22, p. 95, 1848 (type locality: India).

*Notopterus bontianus* VALENCIENNES, Hist. Nat. Poiss., vol. 22, p. 107, pl. 613, 1848 (type locality: Irrawaddi and Java).—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. (76) 151, 1853 (Calcutta).

Depth  $3\frac{3}{4}$  to  $3\frac{5}{6}$ ; head without opercular flap 5 to  $5\frac{2}{3}$ . Eye  $4\frac{1}{4}$  to 5 in head, equals snout or slightly longer; maxillary reaches hind pupil or eye edge, according to age,  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in head; 2 ventral ridges of mandible and preopercle serrated, also lower border of suborbitals. Gill rakers 8,  $\frac{3}{4}$  of eye,  $\frac{1}{3}$  shorter than gill filaments.

Scales about 65 transversely at anal origin; 8 to 10 transverse rows on preopercle; much larger on opercles than on body. Double series of 26 to 33 spines along abdomen.

D. 8 or 9, origin midway between snout and end of caudal, high as postorbital part of head; A. 100 to 110; pectoral long as head without snout, rays 15 to 17; ventral 5.

More or less grayish silvery, back darker. Anal and caudal often margined with blackish. Length, 350 mm. (Weber and Beaufort.)

India, Burma, Siam, Java, Sumatra.

### Family DOROSOMIDAE

Body short, deep, well compressed. Belly compressed to edge armed with bony serra. Head short, rather small. Eyes with adipose lids. Mouth small, inferior, oblique, overlaps blunt snout. No teeth. Mandible short, deep, rami enlarged basally. Premaxillaries not protractile. Gill membranes not united, free from isthmus. Pseudobranchiae large. Branchiostegals 6. Stomach short, muscular, like gizzard of fowl. Scales thin, deciduous, cycloid. Head naked. No lateral line. Dorsal median, usually behind ventrals and last ray often prolonged in filament. Anal very long, low. Caudal forked.

Mud-eating fishes of the coasts and rivers of warm regions, many in fresh water. They are usually little valued as food. The gizzard-like stomach seems to be the outstanding character of distinction for the family.

#### ANALYSIS OF GENERA

- a<sup>1</sup>*. Dentary edge reflected outward in front of maxillary end; mouth toothless, subterminal or inferior, transverse, its cleft forming angle.
- b<sup>1</sup>*. Last dorsal ray not prolonged in filament.
- c<sup>1</sup>*. Maxillary slender, terminally slightly expanded and curved downwards. *Gonialosa*
- c<sup>2</sup>*. Maxillary straight, thin, transversely expanded plate, tapering terminally. *Anodontostoma*
- b<sup>2</sup>*. Last dorsal ray prolonged in filament. *Nematalosa*
- a<sup>2</sup>*. Dentary edge not reflected outward in front of maxillary; mouth terminal or subterminal; last dorsal ray prolonged in filament. *Clupanodon*

#### Genus GONIALOSA Regan

*Gonialosa* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 315, 1917. (Type, *Chatoessus modestus* Day, designated by Jordan, Genera of fishes, pt. 4, p. 560, 1920.)

*Indialosa* HERRE and MYERS, Lingnan Sci. Journ., No. 10, p. 238, 1931. (Type. *Clupanodon manminna* Buchanan-Hamilton, orthotypic.)

Mouth subterminal or inferior, transverse, cleft forming an angle, toothless. Maxillary slender, terminally slightly expanded and curved downward. One supplemental maxillary. Scales 45 to 75 in longitudinal series, 16 to 25 transversely. Vertebrae 44 to 46. Dorsal rays 14 to 17, with basal scaly sheath, last ray not prolonged. Anal rays 22 to 28. Ventrals with 8 rays, below or in advance of dorsal origin.

Rivers of India and Burma. Mouth as in *Nematolosa* but differs in not having last dorsal ray prolonged.

#### ANALYSIS OF SPECIES

- a<sup>1</sup>. Depth 2 to 2½; scales 45 to 47 in lateral series----- *modesta*  
 a<sup>2</sup>. Depth 2¾ to 3½; scales 55 to 65 in lateral series----- *manminna*

#### GONIALOSA MODESTA (Day)

*Chatoessus modestus* DAY, Proc. Zool. Soc. London, 1869, p. 622 (type locality: Bassein River high as Een-gay-gyee Lake, Burma); Fishes of India, pt. 4, p. 633, pl. 160, fig. 1, 1878 (Een-gay-gyee Lake and Moulmein); Fauna British India, Fishes, vol. 2, p. 386, 1889.

*Gonialosa modesta* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 315, 1917 (Burma).

Depth 2 to 2½; head 3½ to 4. Snout shorter than eye, which 3 to 3½ in head; maxillary reaches front eye edge.

Scales 45 to 47 in medial lateral series; 16 to 18 transversely. Ventral scutes 17 to 19+9 to 12.

D. 14 to 17; A. 24 to 28; ventrals below or in advance of dorsal origin.

Usually a dark humeral spot. Length to 100 mm. (Regan.)  
 Burma.

#### GONIALOSA MANMINNA (Buchanan-Hamilton)

*Clupanodon manminna* BUCHANAN-HAMILTON, Fishes of Ganges, pp. 247, 249, 383, 1822 (type locality: Fresh-water branches of Ganges).

*Chatoessus manmina* VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 114, 1848 (compiled).

*Chatoessus manmina* DAY, Fishes of India, pt. 4, p. 633, pl. 160, fig. 2, 1878 (Sind, Ganges, Jumna, Brahmaputra, Mahannadi, Assam); Fauna Brit. India, Fishes, vol. 1, p. 386, 1889.

*Gonialosa manmina* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 315, 1917 (North India and Assam).

? *Clupanodon cortius* BUCHANAN-HAMILTON, Fishes of Ganges, pp. 249, 383, 1822 (type locality: The Brahmaputra near Goyalpara).

*Chatoessus cortius* VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 115, 1848 (copied).—GÜNTHER, Cat. Fish. British Mus., vol. 7, p. 410, 1868 (Bengal; Cachar).

Depth 2¾ to 3½; head 3¾ to 4¼. Snout shorter than eye, which 3 to 3½ in head; maxillary not or barely reaching eye.

Scales 55 to 65 in medial lateral series; 21 to 25 transversely. Ventral scutes 16 to 19+10 to 13.

D. 14 to 17; A. 22 to 26; ventrals below or in advance of dorsal. Sometimes a dark humeral spot. Length to 130 mm. (Regan.) India.

#### Genus ANODONTOSTOMA Bleeker

*Anodontostoma* BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 15, 1849. (Type, *Anodontostoma hasseltii* Bleeker = *Clupanodon chacunda* Buchanan-Hamilton, monotypic.)

Maxillary straight, thin, transversely expanded plate, tapering terminally and supplemental maxillary very slender. Vertebrae 42. Scales 40 or 42 in lateral series, 12 to 17 transversely. Dorsal rays 17 to 19, with broad basal scaly sheath extending to end of last ray, which not prolonged. Anal rays 18 to 21, depressible in scaly sheath. Ventral rays 8, fin below middle or front half of dorsal.

Coasts and rivers of India and Indo-Australian Archipelago.

#### ANALYSIS OF SPECIES

a<sup>1</sup>. Snout little protruded; scales 19 transversely; D. 15\_\_\_\_\_ chanpole

a<sup>2</sup>. Snout well protruded; scales 12 or 13 transversely; D. 17 or 18\_\_\_\_ chacunda

#### ANODONTOSTOMA CHANPOLE (Buchanan-Hamilton)

*Clupanodon chanpole* BUCHANAN-HAMILTON, Fishes of Ganges, pp. 249, 383, pl. 18, fig. 74, 1822 (type locality: Ponds and ditches of every part of Bengal).

*Clupanodon champole* CUVIER, Règne Animal, ed. 2, vol. 2, p. 320, 1829 (on Buchanan-Hamilton).

*Chatocessus chanpole* VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 111, 1848 (copied).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 410, 1868 (no locality).

Depth 2½; head little over 4. Snout not much projecting beyond mouth, which nearly transverse.

Scales 46 in medial lateral series; 19 transversely.

D. 15, origin nearerer snout end than caudal base, scarcely before ventral bases; A. 21.

Blackish spot on shoulder, followed by several other similar but smaller spots. Length, 153 mm. (Günther.)

Bengal.

#### ANODONTOSTOMA CHACUNDA (Buchanan-Hamilton)

*Clupanodon chacunda* BUCHANAN-HAMILTON, Fishes of Ganges, pp. 246, 283, 1822 (type locality: Gangetic estuaries).

*Chatocessus chacunda* VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 111, 1848 (Molucca Sea; Malacca).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1293, 1849 (Pinang and Malay Peninsula).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—KNER, Reise Novara, Fische, p. 337, 1865 (Java).—DAY, Fishes of Malabar, p. 242, 1868.—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 411, 1868 (Cochin, Ganges, Siam, Borneo, Pinang, Sumatra, East Indies, type of *Chatocessus sclanghat*).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1,

p. 404, 1876 (Malabar).—DAY, Fishes of India, pt. 4, p. 632, pl. 160, fig. 3, 1878 (India, Burma, Andamans).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 593, 1883 (New Guinea).—DAY, Fauna British India, Fishes, vol. 1, p. 386, 1889.—WEBER, Zool. Nederland. Ost Ind., vol. 3, p. 427, 1894 (Batavia).—ELERA, Cat. Fauna Filip., vol. 1, p. 582, 1895 (Luzon, Manila).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).

*Dorosoma chacunda* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 143, pl. (3)261, figs. 5–6, 1866–72 (Java, Madura, Bali, Sumatra, Pinang, Singapore, Bintang, Banka, Borneo, Celebes, Halmahera, Amboina).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 616, 1926 (Sarawak).—TIRANT, Service Océanogr., Pêches Indo-Chine, 6<sup>e</sup> note, pp. 116, 174, 1929 (Cochin China).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 100, 1931 (Bagan Si Api Api); vol. 15, livr. 3, p. 227, 1936 (Padang, Tikarbay; Telok Pekadai; Sungai, Terentang; Sungai, Kakap, Borneo).

*Anodontostoma chacunda* JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 771, 1905 (Negros).—SMITH and SEALE, Proc. Biol. Soc. Washington, vol. 19, p. 74, 1906 (Mindanao).—JORDAN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 5, 1907 (Cavite).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26 (1906), p. 54, 1907 (Bacon).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27 (1907), p. 236, 1908 (Manila: Iloilo).—BEAN and WEEDE, Proc. U. S. Nat. Mus., vol. 42, p. 592, 1912 (Batavia).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 25, fig. 14, 1913 (Batavia, Tjilatjap, Bagan Api Api, Nias, Balikpapan, Kota Baru).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 316, 1917 (India; Indo-Australian Archip.).—FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines); Journ. Bombay Nat. Hist. Soc., vol. 30, No. 1, p. 39, 1924 (Calicut).—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 481, 1924 (Singora).—OSHIMA, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Haiho, Hainan).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 258, 1927 (San Fernando; Santa Maria; Orion; Orani); Mem. Bishop Mus., vol. 10, p. 32, 1928 (compiled); Hong Kong Nat., vol. 2, p. 57, fig. 7, 1931 (India; Philippines).—HERRE, Journ. Pan-Pac. Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 15, 1934 (Bauang Sur; Manila).—ROXAS, Philippine Journ. Sci., vol. 55, p. 256, pl. 1, fig. 13 (scale), pl. 3, fig. 1 (head), 1934 (Luzon; Mindoro; Masbate; Leyte; Samar; Panay; Guimaras; Balabac; Mindanao; Borneo).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 86, 1934 (Bangkok); vol. 87, p. 90, 1935 (Bangkok).—SUWATTI, Index Fish. Siam, p. 13, 1937 (Lang Suan; Bangkok; Gulf of Siam; Bang Plasoi; Maenam Canthaburi).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 23, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 13, 1937 (Sumatra coast 100 miles west of Singapore).—FOWLER, List Fish. Malaya, p. 25, 1938 (reference).

*Gonostoma javanicum* KUHL and VAN HASSELT, Algemeen Konst Letterbode, p. 329, 1823 (type locality: Java).

? *Clupea mauritiana* BENNETT, Proc. Zool. Soc. London, pt. 1, p. 32, 1833 (type locality: Mauritius).

*Chatoessus tampo* VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 117, 1848 (type locality: "Dessin du major Farquhar" [Malacca]).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 406, 1868 (copied).

*Anodontostoma hasseltii* BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 15, 1849 (type locality: Madura Straits near Kammal and Surabaya; Java Sea near Batavia, Samarang, etc.).

*Chatocessus selangkat* BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, pp. 16, 47, 1852 (type locality: Batavia, Java).

? *Chatocessus breviceps* PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 848, 1877 (type locality: New Hannover).

*Anodontostoma breviceps* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 316, 1917 (copied).

Depth  $2\frac{1}{10}$  to  $2\frac{1}{2}$ ; head  $3\frac{1}{4}$  to  $3\frac{1}{3}$ , width  $1\frac{7}{8}$  to 2. Snout  $4\frac{1}{8}$  to  $4\frac{1}{5}$  in head; eye  $3\frac{1}{3}$  to 4, greater than snout or interorbital or  $1\frac{1}{5}$  in interorbital with age; maxillary reaches  $\frac{1}{3}$  to  $\frac{2}{5}$  in eye, 3 to  $3\frac{1}{5}$  in head; no teeth; interorbital  $2\frac{3}{4}$  to  $3\frac{1}{8}$ , convexly elevated; many radiating venules on cheek, opercle, postocular and humeral regions. Gill rakers  $65+83$ , finely lanceolate,  $2\frac{1}{2}$  in gill filaments, which  $1\frac{1}{4}$  in eye.

Scales 37 to 40 in median lateral series to caudal base and 3 or 4 more on latter; 12 or 13 scales transversely, 10 or 11 predorsal. Abdominal serra 17 or 18+11 or 12. Scales firmly adherent, narrowly imbricated. Scales with 5 or 6 vertical parallel striae, only most apical one complete, others interrupted medially; apical edges of scales with about 26 weak crenulations, points more or less extended, though narrow and tips rounded; circuli fine, concentric.

D. III, 15, I, first branched ray  $1\frac{1}{4}$  to  $1\frac{1}{2}$  in head, last branched ray  $2\frac{1}{5}$  to  $2\frac{2}{3}$  in first ray; A. II, 16, I or II, 17, I, first branched ray  $3\frac{1}{2}$  to 4 in head; least depth of caudal peduncle 2 to  $3\frac{1}{8}$ ; pectoral  $1\frac{1}{5}$  to  $1\frac{1}{2}$ ; ventral  $1\frac{4}{5}$  to  $2\frac{1}{8}$ ; caudal  $2\frac{3}{4}$  to  $3\frac{1}{8}$  in rest of body, deeply forked, lobes pointed.

Brownish above, sides and below whitish. Dark slaty humeral blotch about size of eye in depth, only width narrower. Iris shows through adipose eyelid largely slaty. Fins pale.

Mauritius, India, Andamans, Burma, Siam, Malay Peninsula, Pinang, East Indies, Philippines, Hainan, Melanesia.

12074. Cavite market, Luzon. December 1, 1908. Length, 145 mm.

13003. Iloilo market. March 28, 1908. Length, 140 mm.

20823. Lingayen Gulf, east of Point Guecet, west Luzon. May 11, 1909. Length, 90 ? mm., caudal tips broken.

20428. Malampaya River, Palawan. December 26, 1908. Length, 133 mm.

11455 to 11457. Manila market. December 12, 1907. Length, 125 to 143 mm.

11886. Manila market. March 14, 1908. Length, 149 mm.

6262, 8188 to 8190. Manila market. June 12, 1908. Length, 135 to 147 mm.

13674 to 13677. Manila market. June 24, 1908. Length, 141 to 149 mm.

10718. Port Ciego, Balabac. January 3, 1909. Length, 148 mm.

Nine examples. Shore above Iloilo River, Panay, June 2, 1909. Length, 45 to 52 mm.

21389. Sebatic Island, Borneo. January 2, 1909. Length, 97 mm.

20751. Sebatic Island. October 1, 1909. Length, 110 mm.

19910. Sebatic Island. November 3, 1909. Length, 111 mm.

11837. Sandakan Bay, Borneo. March 2, 1908. Length, 126 mm.

5257. Sandakan Bay. March 21, 1908. Length, 108–138 mm. 11 examples. Two examples. Sebatic Island, Borneo. October 1, 1909. Length, 41–53 mm. 21259, 21260. Tifoe Bay, Bouro Island. Length, 78–85 mm. U.S.N.M. No. 51981. Negros, Philippines. Dr. Bashford Dean. Length, 82–111 mm. 4 examples. U.S.N.M. No. 56031. Mindanao, Philippines. Bureau of Fisheries (4225). Length, 205 mm. U.S.N.M. No. 56065. Luzon, Philippines. Bureau of Fisheries (3231). Length, 190 mm. U.S.N.M. No. 56308. Cavite, Philippines. Dr. G. A. Lung. Length, 95–143 mm. 2 examples. U.S.N.M. No. 72222. Iloilo, Philippines. R. C. McGregor. Length, 126 mm. U.S.N.M. No. 72515. Cavite, Philippines. Length, 151–153 mm. 2 examples. U.S.N.M. No. 72516. Batavia, Java. 1909. Bryant and Palmer. Length, 212–125 mm. 2 examples. 2 examples. A.N.S.P. Calicut, India. James Hornell. Length, 145–155 mm.

#### Genus NEMATALOSA Regan

*Nematalosa* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 313, 1917. (Type, *Clupea nasus* Bloch, designated by Jordan, Genera of Fishes, pt. 4, p. 560, 1920.)

Mouth toothless, subterminal or inferior, transverse, its cleft forming an angle. Maxillary slender, terminally slightly expanded and curved downward; dentary edge reflected outwards in front of maxillary end; one supplemental maxillary. Vertebrae 43. Scales 44 to 50 in lateral series, 14 to 21 transversely. Dorsal rays 13 to 18, with scaly basal sheath and last ray prolonged in filament. Anal rays 18 to 24. Ventral rays 8, below or little before dorsal.

Coasts and rivers of Asia and Australia, from Arabia to Japan and New South Wales.

#### ANALYSIS OF SPECIES

- a*<sup>1</sup>. Second suborbital with oblique antero-inferior edge, leaves naked area above lower preopercle limb.
- b*<sup>1</sup>. Depth 2 to 2½; A. 20 to 22----- *come*
- b*<sup>2</sup>. Depth 2¾ to 3.
- c*<sup>1</sup>. A. 19.
- d*<sup>1</sup>. Depth 2¾----- *arabica*
- d*<sup>2</sup>. Depth 3----- *elongata*
- c*<sup>2</sup>. A. 21 to 23; depth 3----- *japonica*
- a*<sup>2</sup>. Second suborbital covers cheek, front edge vertical and lower edge horizontal and in contact with lower preopercle limb----- *nasus*

#### NEMATALOSA COME (Richardson)

*Chatocetus come* (Russell) RICHARDSON, Voy. *Erebus* and *Terror*, Fishes, p. 62, 1846 (type locality: Western Australia; Indian Ocean).

*Chatoessus come* RICHARDSON, Ichth. Voy. *Erebus* and *Terror*, Fishes, pl. 38, figs. 7–9, 1846.—KLUNZINGER, Arch. Naturg., vol. 38, p. 43, 1872 (Murray River).

*Dorosoma come OGILBY*, Commere. Fish, Fisher. Queensland, p. 47, 1915 (Brisbane); Mem. Queensland Mus., vol. 3, p. 133, 1915 (Norman R.).—WAITE, Rec. South Australian Mus., vol. 2, p. 38, fig. 54, 1921.

*Nematalosa come REGAN*, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 314, 1917 (Indo-Australian Archipelago).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 17, pl. 5, fig. 56a, 1927; Austral. Mus. Mem., vol. 5, p. 41, 1929 (reference).

*Chatocessus nasus* (not Bloch) GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 407, 1868 (part).—KENT, Great Barrier Reef, p. 370, 1893 (Queensland).—WEBER, in Semon's Zool. Forsch. Reis. Austral., vol. 5, p. 274, 1895 (Burnett River).

*Dorosoma nasus* BLEEKER, Atlas Ichth. Ind.-Néerland, vol. 6, p. 142, pl. (2)260, fig. 4, 1866-72.—STEAD, Edible fishes New South Wales, p. 24, pl. 3, 1908.—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 24, 1913 (part).

*Chatocessus erebi* GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 407, 1868 (type locality: Namoi and Cape York, New South Wales).—CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 1, p. 184, 1872 (Melbourne market Murray, Darling, Clarence, Burnett and Fitzroy Rivers); Proc. Linn. Soc. New South Wales, vol. 2, p. 24, 1878 (Brisbane River mouth).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 368, 1880 (Burnett and Fitzroy Rivers).—KLUNZINGER, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 418, 1880 (Murray River).—GÜNTHER, Rep. Voy. Challenger, vol. 1, p. 33, 1880 (Tiaro, Mary River; ? lat.  $27^{\circ} 9'$  S., long.  $144^{\circ}$  E.).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 258, 1881 (North and West coasts).—WOODS, Fish Fisher. New South Wales, p. 106, 1882.—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 209, 1884 (Lower Burdekin River).—OGILBY, Cat. Fish. New South Wales, p. 55, 1886.—KENT, Great Barrier Reef, pp. 302, 370, 1893.—WEBER, in Semon's Zool. Forsch. Reis. Australia, vol. 5, p. 274, 1895 (Burnett River).

*Chaetocessus erebi* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 7, p. 71, 1883 (Palmer River).

*Nematalosa erebi* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 314, 1917 (Cape York, Burnett River, Mary River, New South Wales).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 17, 1927; Austral. Mus. Mem., No. 5, p. 41, 1929 (reference).

*Chatocessus richardsoni* CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 144, 1873 (type locality: Rivers of Murray River system, Australia).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 4, p. 369, 1880 (Murrumbidgee); vol. 6, p. 258, 1881 (Murray basin).—WOODS, Fish Fisher. New South Wales, p. 106, 1882.—OGILBY, Cat. Fishes New South Wales, p. 55, 1886.—LUCAS, Proc. Roy. Soc. Victoria, new ser., vol. 2, p. 37, 1890 (reference).—OGILBY, Edible Fishes New South Wales, p. 178, 1893.

*Nematalosa richardsoni* WAITE, Rec. South Austral. Mus., vol. 3, p. 225, pl. 13, 1927.—McCULLOCH, Austral. Mus. Mem., vol. 5, p. 41, 1929 (reference).

*Chatocessus horni* ZEITZ, Rep. Horn Sci. Exped., vol. 2, p. 180, pl. 16, fig. 6, 1896 (type locality: Red Bank Creek, McDonnell Ranges, Central Australia).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).

*Nematalosa horni* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 314, 1917  
 (types from Red Bank Creek; Bulloo Creek in Queensland; Borwan River in New South Wales).—McCULLOCH, Fishes of New South Wales, ed. 2, p. 17, 1927.

Depth  $2\frac{1}{4}$  to  $2\frac{3}{5}$ ; head  $3\frac{4}{5}$  to 4, width  $1\frac{7}{8}$  to  $2\frac{1}{5}$ . Snout  $4\frac{1}{2}$  in head, protrudes well beyond eye; eye  $4\frac{1}{2}$ , 1 in eye,  $1\frac{1}{5}$  in interorbital, adipose lids largely covering eye; maxillary reaches  $\frac{1}{3}$  in eye, length 4 to  $4\frac{1}{4}$  in head; interorbital  $3\frac{1}{2}$  to  $3\frac{2}{5}$ , rather broadly convex; opercle smooth. Gill rakers 185+218, setiform, slender,  $2\frac{1}{3}$  to  $2\frac{2}{3}$  in gill filaments, which  $1\frac{1}{2}$  in eye.

Scales 36 in median lateral series to caudal base and 4 more on latter; 15 scales transversely, 21 predorsal. Abdominal serrae 15+12. Ventral axillary scale  $\frac{2}{5}$  of fin. Scales with 6 or 7 marginal striae, of which 1 crosses scale transversely or vertically; circuli as transverse close-set vertical striae; apically continuous portion with radiating flatings crossed by waved transverse striae.

D. IV, 10, first branched ray  $1\frac{1}{3}$  in head, last elongated ray  $2\frac{3}{4}$  to  $3\frac{1}{4}$  in combined head and body to caudal base; A. II, 16 to 18, first branched ray  $2\frac{7}{8}$  to  $3\frac{1}{3}$ ; caudal  $2\frac{7}{8}$  to 3 in rest of body, deeply forked, slender lobes pointed; least depth of caudal peduncle  $2\frac{1}{8}$  to  $2\frac{1}{4}$  in head; pectoral  $1\frac{1}{5}$ ; ventral  $1\frac{3}{4}$  to  $1\frac{4}{5}$ .

Back olivaceous, with steel-blue reflections. Sides and lower surfaces, also iris, silvery white. Dorsal and caudal brownish, lower fins pale.

Western Australia, Queensland, New South Wales.

U.S.N.M. No. 47866. Mary River. Australian Museum. Length, 255 mm.

U.S.N.M. No. 47867. Burdekin River. Australian Museum. Length, 245 mm.

#### NEMATALOSA ARABICA Regan

*Nematalosa arabica* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 313, 1917  
 (type locality: Muscat).

Depth  $2\frac{3}{5}$ ; head  $3\frac{2}{5}$ . Snout equals eye, which  $4\frac{1}{2}$  in head; maxillary reaches  $\frac{1}{4}$  in eye; second suborbital with oblique lower edge, leaves naked space above lower limb of preopercle.

Scales 50 in medial lateral series, 19 transversely. Ventral scutes 18+13.

D. 17; A. 19; ventral little before middle of dorsal.

Dark longitudinal streaks along series of scales on upper part of body. Length, 150 mm. (Regan.)

Arabia. Known only from type.

#### NEMATALOSA ELONGATA (MacLeay)

*Chatoessus elongatus* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 209, 1884 (type locality: Lagoons, Mary River, Queensland).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 9, p. 59, 1884 (compiled).—KENT, Great Barrier Reef, p. 370, 1893.

*Nematalosa elongata* JOHNSTON and BANCROFT, Proc. Roy. Soc. Queensland, vol. 33, p. 177, 1921 (mortality at Longreach, Thomson River).—McCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 132, 1925 (reference).—McCULLOCH, Austral. Mus. Mem., vol. 5, p. 132, 1929 (reference).

Depth 3, little more than head; profile of head somewhat flatter than in *Nematalosa come*. Eye  $\frac{2}{3}$  hidden by adipose membrane.

Scales 42 in median lateral series. Abdomen strongly serrated its whole length, scales not deciduous.

D. 14, last ray reaches caudal origin; A. 19; ventral begins opposite third dorsal ray.

Silvery, with back and fins darker. Length, 280 mm. (Macleay.) Queensland, in fresh water.

#### NEMATALOSA JAPONICA Regan

*Nematalosa japonica* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 313, 1917 (type locality: Inland sea of Japan).

Depth 3; head  $4\frac{1}{3}$ . Snout equals eye, which  $4\frac{1}{2}$  in head; maxillary reaches  $\frac{1}{3}$  in eye; second suborbital with oblique lower edge, leaves naked space above lower limb of preopercle.

Scales 48 to 50 in medial lateral series, 19 or 20 transversely. Ventral scutes 19 or  $20+12$  to 14.

D. 16 to 18; A. 21 to 23; ventral below front or middle part of dorsal.

A dark humeral spot. Length, 200 mm. (Regan.)

Japan. Described from 3 specimens.

#### NEMATALOSA NASUS (Bloch)

*Clupca nasus* BLOCH, Naturg. ausländ. Fische, vol. 9, p. 116, pl. 429, fig. 1, 1795 (type locality: Malabar).—SCHNEIDER, Syst. Ichth. Bloch, p. 426, 1801 (Malabar).—CUVIER, Règne animal, vol. 2, p. 174, 1817 (reference); ed. 2, vol. 2, p. 320, 1829 (on Kome Russell, Fishes of Coromandel, vol. 2, p. 76, pl. 196, 1803, Vizagapatam).

*Chatocessus nasus* SWAINSON, Nat. Hist. Animals, vol. 2, p. 293, 1839 (copied).—VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 104, 1848 (Pondicherry; Bombay).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853 (reference).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 407, 1868 (part).—DAY, Fishes of India, pt. 4, p. 634, pl. 160, fig. 4, 1878 (India).—BOULENGER, Proc. Zool. Soc. London, 1887, p. 666 (Muscat).—DAY, Fauna Brit. India, Fishes, vol. 1, p. 387, fig. 120, 1889.—ELERA, Cat. Fauna Filip., vol. 1, p. 581, 1895 (Luzon: Manila).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, pp. 116, 174, 1929 (Thudaunot).

*Dorosoma nasus* BLEEKER, Atlas Ichth. Ind. Néerland, vol. 6, p. 142, pl. (2) 260, fig. 4, 1866–72 (Java, Singapore, Banka, Celebes, Batjan, Obi Major, Amboina, Ceram, Philippines).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 71, pt. 1, p. 156, 1907 (Tamarida, Kor Garrieh, Gischin).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 24, 1913 (Bleeker's specimen).—OSHIMA, Annot. Zool. Japon., vol. 11, p. 2, 1926 (Haiho, Hainan).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>e</sup>

- note, p. 7, 1926 (Tonkin).—DERANIYAGALA, Spolia Zeylanica, vol. 15, p. 45, 1929.—TANAKA, Jap. Fish. Life Colours, No. 44, 1933.
- Konosirus nasus* JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 625, 1906 (East Indies, north to southern Japan).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907.
- Clupanodon nasus* JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 328, 1902 (Formosa, Giran, Kotosho).
- Clupanodon nasus* MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Chin-nampo, Korea) (error).
- Nematalosa nasus* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 313, 1917 (Sind, Bombay, Canara, Madras, Calicut, Burma).—FOWLER, Hong Kong Nat., vol. 2, p. 56, fig. 6, 1931 (compiled).—HERRE, Fishes Herre Philippine Exped., 1931, p. 15, 1934 (Culion).—ROXAS, Philippine Journ. Sci., vol. 55, p. 254, pl. 1, fig. 1 (scale), pl. 3, fig. 2 (head), 1934 (Luzon; Panay; Palawan; Mindanao; Amoy, China).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 231, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 13, 1937 (Sumatra coast 100 miles west of Singapore).—FOWLER, List Fish. Malaya, p. 25, 1938 (reference).
- Anodontostomus nasus* SUVATTI, Index Fish. Siam, p. 14, 1937 (Thale Sap Song-khla; Canthaburi; Pak Phayun; Thale Noi).
- Clupea thrissa* (not Linnaeus) BONNATERRE, Tableau Encyclop. Ichth., p. 188, pl. 76, 1788 (Sea of the Indies).
- Konosirus thrissa* JORDAN and SEALE, Proc. Davenport Acad. Sci., vol. 10, p. 2, 1905 (Hong Kong).—JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 167, 1909 (Takao).
- Clupanodon nasica* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 468, 472, 1803 (Malabar; on Bloch).
- Chatoessus altus* GRAY, Illustr. Indian Zool. Hardwicke, vol. 2, p. 91, fig. 2, 1832-34 (type locality: India).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 146, 1851.—DAY, Fishes of Malabar, p. 243, 1865.
- Chatoessus selangkat* (not Bleeker) KNER, Reise Novara, Fische, p. 337, 1865 (Java).
- Chatoessus chanpole* (not Buchanan-Hamilton) GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 410, 1868 (no locality).

Depth  $2\frac{1}{2}$  to  $2\frac{4}{5}$ ; head  $3\frac{2}{3}$  to 4. Snout long as or shorter than eye, which  $3\frac{1}{3}$  to 4 in head; maxillary reaches  $\frac{1}{4}$  in eye; second suborbital covering cheek, with vertical anterior edge and horizontal inferior edge attached to lower limb of preopercle.

Scales 45 to 50 in medial lateral series; 15 to 19 transverse. Ventral scutes 16 to 19+10 to 12. D. 15 to 17; A. 21 to 24; ventrals below origin or anterior third of dorsal.

Dark longitudinal streaks along upper series of scales. Often a dark humeral spot. Length, 200 mm. (Regan.)

India, Burma.

#### Genus CLUPANODON Lacépède

- Clupanodon* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 465, 1803. (Type, *Clupea thrissa* Linnaeus, designated by Bleeker, Atlas Ichth. Ind. Néerland., vol. 6, p. 112, 1866-72.) (Type, *Clupanodon jussieu* LACÉPÈDE, designated by Jordan and Gilbert, Proc. U. S. Nat. Mus., vol. 5, p. 574, 1882, invalid.)

*Thrissa* RAFINESQUE, Analyse de la nature, p. 88, 1815. (Type, *Clupea thrissa* Linnaeus, virtually. *Thrissa* Rafinesque, proposed to replace *Clupanodon* Lacépède.)

*Konosirus* JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 349, 1900. (Type, *Chatoessus punctatus* Schlegel, orthotypic.)

*Konoshirus* JORDAN and SNYDER, Ann. Zool. Japon., vol. 3, p. 53, 1901. (Type, *Chatoessus punctatus* Schlegel.)

*Nealosa* HERRE and MYERS, Lingnan Sci. Journ., No. 10, p. 236, 1931. (Type, *Chatoessus punctatus* Schlegel, orthotypic.)

Mouth terminal or subterminal, with lateral cleft and toothless. Maxillary normal, reaches front or middle part of eye; front supplemental maxillary absent. Gill rakers slender, very numerous. Vertebrae 49 to 51. Scales 48 to 58 in lateral series, 20 to 23 transversely. Dorsal rays 15 to 18, last ray prolonged in filament. Anal rays 20 to 28, low. Ventral rays 8, fin below front part of dorsal.

Shores and rivers of China and Japan.

#### ANALYSIS OF SPECIES

- |   |                  |
|---|------------------|
| <i>a<sup>1</sup>.</i> Depth 2½ to 3¼; scales 48-----      | <i>thrissa</i>   |
| <i>a<sup>2</sup>.</i> Depth 3 to 3½; scales 53 to 58----- | <i>punctatus</i> |

#### CLUPANODON THRISSA (Linnaeus)

*Clupea thrissa* LINNÆUS, Syst. Nat., ed. 10, vol. 1, p. 318, 1758 (type locality: Indian Ocean; on Lagerstrom, 1750; Osbeck, 1757).—OSBECK, Reise Ost Ind. China, p. 336, 1765 (China).—BROUSSONET, Ichth., vol. 1, no pagination, pl., 1782 (India, China; not Carolina and Jamaica).—HOUTTUYN, Verh. Holland. Maatsch. Haarlem, vol. 20, p. 341, 1782 (Japan).—BONNATERRE Tableau encyclop. Ichth., p. 186, (not pl. 76, fig. 315), 1788 (part; Sea of the Indies).—GMELIN, Syst., Nat. Linn., vol. 1, p. 1406, 1789 (India, China, Japan).—BLOCH, Naturg. ausländ. Fische, vol. 9, pl. 404, 1795.—FORSTER, Fauna Indica, p. 16, 1795.—SCHNEIDER, Syst. Ichth. Bloch, p. 424, 1801 (India, China, Japan).—CUVIER, Règne animal, ed. 2, vol. 2, p. 174, 1829 (reference).

*Clupanodon thrissa* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 468, 470, 1803 (China).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 309, 1917 (Formosa and China).—FOWLER, Journ. Bombay Nat. Hist. Soc., vol. 33, p. 103, 1928 (Bombay); Mem. Bishop Mus., vol. 10, p. 32, 1928 (compiled); Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 599, 1930 (Hong Kong); Hong Kong Nat. vol. 2, p. 54, 1931 (Hong Kong).

*Dorosoma thrissa* RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 63 (Swatow).—TANAKA, Jap. Fish. Life Colours, No. 43, 1933.

*Konosirus thrissa* JORDAN and SEALE, Proc. Davenport Acad. Sci., vol. 10, p. 2, 1905 (Hong Kong).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 626, 1906 (compiled).—EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26, 1906, p. 54, 1907 (Philippines).—HERRE, Fish Herre Philippine Exped. 1931, p. 15, 1934 (Sitanki).

*Chatoessus osbecki* VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 106, 1848 (type locality: China).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 406, 1868 (copied).

*Clupanodon osbecki* MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Jin-sen, Korea) (error).

*Chatoessus triza* RICHARDSON, Ichth. China Japan, p. 307, 1846 (type locality: China Sea).

*Chatoessus chrysopterus* RICHARDSON, Ichth. China Japan, p. 308, 1846 (type locality: China Sea).

*Chatoessus maculatus* (Gray) RICHARDSON, Ichth. China Japan, p. 308, 1846 (type locality: Canton; Chinese Sea).—VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 108, 1848.—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 409, 1868 (Formosa).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> note, pp. 30, 174, 1929 (Hué).—CHEVEY, Inst. Océanogr. Indochine, 19<sup>e</sup> note, p. 8, 1932 (Indochina).

*Clupanodon maculatus* JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 327, 1902 (Giran, Formosa).

*Amblygaster maculatum* JORDAN and RICHARDSON, Mem. Carnegie Mus., vol. 4, p. 166, 1909 (copied 1902).

*Chatoessus nasus* (not Bloch) GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 407, 1868 (Cochin, Java, Amboina, Philippines).—RAMSAY and OGILBY, Proc. Linn. Soc. New South Wales, ser. 2, vol. 1, p. 8, 1886 (Strickland River, New Guinea).

*Konosirus nasus* SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 462, 1906 (Urado).—SEALE and BEAN, Proc. U. S. Nat. Mus., vol. 33, p. 239, 1907 (Zamboanga).

*Clupca (Clupanodon) libertatis* (not Günther) BLEEKER, Nederland. Tijdschr. Dierk., vol. 4, p. 118, 1874 (Chinese drawing).

*Chatoessus punctatus* (not Schlegel) ELERA, Cat. Fauna Filip., vol. 1, p. 582, 1895 (Luzon, Cavite, Santa Cruz).

*Clupanodon paihoensis* OSHIMA, Annot. Zool. Japon., vol. 11, p. 3, 1926 (type locality: Haiho, Hainan).

Depth  $2\frac{3}{4}$  to  $3\frac{1}{4}$ ; head  $3\frac{1}{8}$  to  $3\frac{3}{5}$ , width  $2\frac{1}{5}$  to  $2\frac{7}{8}$ . Snout 4 to  $4\frac{1}{4}$  in head, mandible tip well inferior or snout protruding; eye  $3\frac{2}{5}$  to  $4\frac{1}{4}$ , greater than snout in young to 1 to  $1\frac{1}{8}$  in snout with age, greater than interorbital in young to equal with age; broad adipose lids cover  $\frac{1}{3}$  of eye in front and behind; maxillary reaches  $\frac{1}{4}$  to  $\frac{1}{3}$  in eye, expansion 2 in eye, length  $2\frac{2}{3}$  to 3 in head; interorbital  $4\frac{1}{8}$  to  $4\frac{1}{3}$ , slightly convex. Gill rakers 215+220 (132+160? in young), fine, setiform, slightly longer than gill filaments or  $1\frac{1}{4}$  to  $2\frac{1}{5}$  in eye.

Scales 44 or 45 in median lateral series to caudal base and 3 or 4 more on latter; 17 scales transversely, 16 predorsal. Abdominal serrae 17 to  $19+10$  to 12. Postocular, occipital and suprascapular region, cheek and preopercle venulose. Scales with 2 or 3 vertical striae, sometimes these or only 1 complete, besides many fine parallel vertical striae; broadly entire vertically.

D. III or IV, 12, I or 13, I, first branched ray  $1\frac{2}{5}$  to  $1\frac{7}{8}$  in head, last ray  $1\frac{1}{6}$  to  $1\frac{1}{5}$  in head in young or  $2\frac{3}{4}$  to  $2\frac{4}{5}$  in combined head and body to caudal base with age; A. II or III, 19, I to 23, I, first branched ray  $3\frac{2}{5}$  to  $4\frac{1}{4}$  in head; least depth of caudal peduncle  $2\frac{1}{4}$  to 3; pectoral  $1\frac{1}{3}$  to  $1\frac{3}{5}$ ; ventral  $2\frac{1}{5}$  to  $2\frac{3}{4}$ ; caudal  $3\frac{1}{8}$  to  $3\frac{1}{4}$  in combined head and body to caudal base.

Back slate gray, sides and below white. Six dark slate-black blotches along upper side to back from behind suprascapula, first largest, others gradually smaller. Iris yellowish white. Fins brownish. Dorsal and caudal with little dusky terminally.

India, East Indies, Philippines, Cochin China, Hainan, China, Formosa, Japan, Korea.

U.S.N.M. No. 6495. Hong Kong? Length, 187 or 188 mm. 2 examples.

U.S.N.M. No. 56105. Philippine Islands. Bureau of Fisheries (4171). Length, 203 mm. As *Konosirus thrissa*.

U.S.N.M. No. 57625. Japan. P. L. Jouy. Length, 170–205 mm. 2 examples.

U.S.N.M. No. 58043. Zamboanga. Dr. E. A. Mearns. 1906. Length, 140–185 mm. 4 examples.

U.S.N.M. No. 59802. Urado, Japan. Dr. H. M. Smith. Length, 130–180 mm. 3 examples.

3 examples. A.N.S.P. Bombay, India. Prof. F. Hallberg. Length, 85–104 mm. 2 examples. A.N.S.P. Hong Kong. April 26, 1929. Henry W. Fowler. Length, 168–176 mm.

11807 to 11810. Panabutan Bay, Mindanao. February 5, 1908. Length, 167–185 mm.

5009. Panabutan Bay. February 6, 1908. Length, 210 mm.

17552. Sorsogon market. March 12, 1909. Length, 177 mm.

1 example. Sandakan Bay, Borneo. March 2, 1908. Length, 100 mm.

6318, 9959. Kowloon market, China. September 18, 1908. Length, 170?–178 mm.

1 example. Japan. P. L. Jouy. Length, 93 mm.

#### CLUPANODON PUNCTATUS (Schlegel)

*Chatocessus punctatus* SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 240, pl. 109, fig. 1, 1846 (type locality: Bays on coast of southwest Japan).—VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 107, 1848 (copied).—BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. (18) 50, 1853 (Nagasaki); (Japan), vol. 26, p. 6, 1857 (Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 6, 1858 (Japan); Nederland. Tijdschr. Dierk., vol. 2, p. 57, 1865 (Amoy).—KNER, Reise Norara, Fische, p. 336, 1865 (Madras; Tahiti).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 408, 1868 (Japan, Amoy, type of *Chatocessus aquosus*); Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 158, 1874 (Chefoo).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 404, 1876 (Yeddo and Yokohama).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 9, 1897.—GÜNTHER, Ann. Mag. Nat. Hist., ser. 7, vol. 1, p. 263, 1898 (Newchang, North China).

*Dorosoma punctatum* RUTTER, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 62 (Swatow).

*Konosirus punctatus* JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 349, 1900 (Tokyo); Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 462, 1906 (Urado).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 624, 1906 (Tokyo, Nagasaki, Matsushima Bay).—FRANZ, Abh. Bayer Akad. Wiss., vol. 4, Suppl. vol. 1, p. 5, 1910 (Sagami Bay and Misaki).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Tokyo, Misaki, Kagoshima).—JORDAN and THOMPSON, Mem. Carnegie Mus., vol. 6, p. 208, 1914 (Nogoya).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 184, 1920 (Jusangata).—WU, Contr.

Biol. Lab. Sci. Soc. China, vol. 5, No. 4, p. 18, fig. 14, 1929 (Amoy).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 37, 1930 (Far East seas).

*Clupanodon punctatus* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 309, 1917 (China and Japan).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 120, 1925 (Misaki, Miakawa Bay, Kagoshima Bay, Fukui, Miyazu, Tokyo, Kyoto).—FOWLER, Mem. Bishop Mus., vol. 10, p. 32, 1928 (compiled).—SCHMIDT and LINDBERG, Bull. Acad. Sci. U. S. S. R., 1930, p. 1187 (Tsuruga).—FOWLER, Hong Kong Nat., vol. 2, p. 55, fig. 5, 1931 (compiled).—SCHMIDT, Bull. Acad. Sci. U. S. S. R., 1931, p. 103 (Obama); Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 18, 1931 (Nagasaki; Kagoshima).—IKEDA, Hakubutugaku Zassa, vol. 36, p. 583, 1937 (Momotori-Mura).

*Clupanodon punctatus* MORI, Journ. Pan Pacific Res. Inst., vol. 3, 1928 (Fusan, Korea) (error).

*Chatoessus aquosus* RICHARDSON, Ichth. China Japan, p. 307, 1846 (type locality: Chinese Sea).—VALENCIENNES, Hist. Nat. Poiss., vol. 21, p. 109, 1848 (compiled).

*Clupanodon thrissa* (not Linnaeus) JORDAN and SNYDER, Proc. U. S. Nat. Mus., vol. 23, p. 743, 1900 (Yokohama).

Depth  $3\frac{1}{8}$  to  $3\frac{5}{8}$ ; head  $3\frac{1}{5}$  to  $3\frac{1}{3}$ , width  $2\frac{2}{3}$  to  $2\frac{3}{4}$ . Snout 5 to  $5\frac{1}{2}$  in head, mandible tip only slightly inferior; eye  $4\frac{2}{3}$  to  $5\frac{3}{4}$ ,  $1\frac{1}{8}$  to  $1\frac{1}{5}$  in snout,  $1\frac{1}{5}$  to  $1\frac{1}{2}$  in interorbital, broad lids largely cover eye; maxillary reaches  $\frac{1}{4}$  to  $\frac{1}{2}$  in eye, expansion  $1\frac{4}{5}$  to  $2\frac{1}{2}$  in eye, length  $2\frac{3}{4}$  to  $3\frac{1}{5}$  in head; interorbital 4 to  $4\frac{2}{5}$ , broadly convex. Gill rakers  $182+170$  (in medium-sized example), setiform, subequal with gill filaments or  $1\frac{1}{2}$  in eye.

Scales 42 to 46 in median lateral series to caudal base and 4 or 5 more on latter; 17 scales transversely, 20 to 26 predorsal. Abdominal serra 20+13 to 15. Axillary ventral scale  $\frac{3}{5}$  of fin. Scales with single transverse or pronounced vertical striae; circuli extend over entire scale area as fine close set vertical striae.

D. III, 14, I, first branched ray  $1\frac{2}{3}$  to  $1\frac{3}{4}$  in head, last ray  $1\frac{1}{8}$  to  $2\frac{2}{3}$  in combined head and body measured to caudal base; A. III, 17, I, first branched ray  $3\frac{2}{3}$  to 4 in head; caudal 1 to  $1\frac{1}{8}$ ; least depth of caudal peduncle  $3\frac{1}{5}$  to  $3\frac{2}{3}$ ; pectoral  $1\frac{3}{5}$  to  $1\frac{4}{5}$ ; ventral  $2\frac{2}{5}$  to  $2\frac{1}{2}$ .

Back gray or brown, with metallic bluish reflections. Each scale on back with small round dusky basal spot, appearing as longitudinal rows. Sides of head and body silvery white. Usually dark or dusky humeral blotch or bar, equals vertical eye diameter. Iris whitish. Dorsal and caudal pale brownish, lower fins whitish.

India, China, Japan, Korea, Polynesia.

U.S.N.M. No. 22538. Japan. Japanese Government. Length, 93–220 mm. 6 examples.

U.S.N.M. No. 26245. Japan. 1878. E. E. Morse. Length, 135–154 mm., caudal ends broken. 10 examples.

U.S.N.M. No. 37759. Korea. Bernandon. Length, 104 mm., caudal ends broken.

U.S.N.M. No. 38837. Tokyo market. Educational Museum of Tokyo. Length, 245 mm.

- U.S.N.M. No. 44891. Japan. Japanese Government. Length, 198?-225 mm. 4 examples.  
 U.S.N.M. No. 49506. Tokyo. *Albatross* collection. Length, 163-215 mm. 2 examples.  
 U.S.N.M. No. 57624. Japan. P. L. Jouy. Length, 192 mm.  
 U.S.N.M. No. 59803. Urado, Japan Dr. H. M. Smith. Length, 155 mm.  
 U.S.N.M. No. 71048. Tokyo market. *Albatross* collection. 1906. Length, 190-198 mm. 3 examples.  
 U.S.N.M. No. 71050. Japan. *Albatross* collection. Length, 225 mm.  
 U.S.N.M. No. 82607. Wakanoura, Japan. Jordan and Snyder. Length, 95-104 mm. 2 examples.

## Family STOLEPHORIDAE

Body elongated, belly rounded. Jaws nearly or quite equal. Mouth terminal, rather small, bordered by small premaxillary and long maxillary; maxillary broad and rounded behind, with 2 supplemental bones. Small teeth in jaws, on vomer, palatines, pterygoids and tongue, which deciduous or may be absent, none caninelike. Gill membranes separate, free from isthmus. Gill rakers very fine and slender, not numerous. Pseudobranchiae present. Branchiostegals 6 to 15. Scales moderate or large, thin, deciduous. Belly without scutes and covered with surrounding scales. Fins small; anal short.

Small clupeids of tropical or subtropical seas, well distinguished as the round herrings, as their bellies rounded and without scutes or spines.

## ANALYSIS OF GENERA

- a<sup>1</sup>.* Dorsal inserted above ventrals; teeth feeble or absent; dorsal with less than 18 branched rays.  
*b<sup>1</sup>.* Dorsal origin nearer snout tip than caudal; anal rays 9 to 13—*Stolephorus*  
*b<sup>2</sup>.* Dorsal origin nearer caudal than snout tip; anal rays 15 to 17  
*Dussumieria*  
*a<sup>2</sup>.* Dorsal well before ventrals; teeth moderate; dorsal branched rays 18 to 29; anal rays 11—*Etrumeus*

## Genus STOLEPHORUS Lacépède

*Stolephorus* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, p. 381, 1803. (Type, *Atherina japonica* Houttuyn, designated by Jordan and Gilbert, U. S. Nat. Mus. Bull. 16, p. 272, 1883.)

*Spratelloides* BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, pp. 12, 29, 1852. (Type, *Clupea argyrotaeniata* Bleeker = *Clupea gracilis* Schlegel, monotypic.)

*Gilchristella* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 365, 1935.  
(Type, *Spratelloides aestuarius* Gilchrist, orthotypic.)

Body elongate, somewhat compressed. Tail very short. Snout conic. Adipose eyelids mostly obsolete. Jaws nearly or quite equal. Mouth cleft small, bordered by elongate premaxillary and broad maxillary, which rounded behind and with 2 supplemental bones. No teeth, or if present very minute or deciduous in jaws, on vomer.

pterygoids and tongue. Gill membranes separate, free from isthmus. Pseudobranchiae large. Branchiostegals 6, flat. Scales deciduous, large, thin. Dorsal short, inserted opposite ventral or nearer snout tip than caudal base. Anal very short, rays 9 to 15.

Indo Pacific. Small, brilliant silvery little round herrings, with small fins.

#### ANALYSIS OF SPECIES

*a<sup>1</sup>*. Scales in lateral line 35 to 38; no silvery white lateral band.

*b<sup>1</sup>*. A. 9 to 10----- *delicatulus*

*b<sup>2</sup>*. A. 11 to 12----- *alburnus*

*a<sup>2</sup>*. Scales in lateral line 40 to 44.

*c<sup>1</sup>*. No brilliant silvery white lateral band; A. 9----- *robustus*

*c<sup>2</sup>*. Brilliant silvery white lateral band present.

*d<sup>1</sup>*. A. 13----- *japonicus*

*d<sup>2</sup>*. A. 19 to 21----- *madagascariensis*

#### STOLEPHORUS DELICATULUS (Bennett)

*Clupea delicatula* BENNETT, Proc. Comm. Zool. Soc. London, vol. 1, p. 168, 1831  
(type locality: Mauritius).

*Spratelloides delicatulus* GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 464, 1868  
(East Indies and Australia).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6,  
p. 96, pl. (6) 264, fig. 3, 1866–72 (Singapore, Banka, Celebes, Halmahera,  
Ternate, Amboine, Saparoua, Banda).—SCHMELTZ, Cat. Mus. Godeffroy,  
No. 5, p. 37, 1874 (Samoa).—PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p.  
445 (Mauritius).—ALLEYNE and MACLEAY, Proc. Linn. Soc. New South  
Wales, vol. 1, p. 350, 1877 (Darnley I.).—SCHMELTZ, Cat. Mus. Godeffroy,  
No. 7, p. 58, 1879 (Samoa).—MACLEAY, Proc. Linn. Soc. New South Wales,  
vol. 6, p. 260, 1881 (reference).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39,  
1884 (Samoa).—KENT, Great Barrier Reef, pp. 302, 370, 1893 (Queens-  
land).—REGAN, Ann. Natal Gov. Mus., vol. 1, p. 242, 1908 (Kosi Bay).—  
GÜNTHER, Jour. Mus. Godeffroy, pt. 16, p. 383, 1909 (Samoa, Jaluit, Bon-  
ham Islands).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 4, 1913 (Kan-  
geang Island, Siau, Karkaralang, Salibabu, Obi Major, between Fau and  
Gebe, between Gusi Bay and Ceram Laut, Saleyer, Tuir Island).—WEBER  
and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 20, 1913.—  
GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, p. 296, 1917 (ref-  
erence).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 110, 1925  
(Zululand coast).—CHABANAUD, Service Océanogr. Péches Indo-Chine, 1<sup>o</sup>  
note, p. 7, 1926 (Annam coast; Tonkin).—TIRANT, Service Océanogr. Péches  
Indo-Chine, 6<sup>o</sup> Note, p. 122, 1929 (Cochinchina).—HARDENBERG, Treubia,  
vol. 14, livr. 2, p. 216, 1933 (Thousand Is. near Batavia; Karimon Djawa;  
Bawean; Kangean Archipelago).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8,  
No. 4, p. 6, 1933 (Dumaguete); Fishes Herre Philippine Exped. 1931, p. 14,  
1934 (Calapan; Culion; Dumaguete; Sitanki).—ROXAS, Philippine Journ.  
Sci., vol. 55, p. 250, 1934 (Bacon).—HERRE, Mid-Pacific Mag., vol. 10, p.  
163, No. 2, April-June 1935 (Pelew Islands).—ROXAS and MARTIN, Dept.  
Agr. Comm. Manila Tech. Bull. 6, p. 23, 1937 (reference).

*Stolephorus delicatulus* JORDAN and SEALE, Bull. Bur. Fisher., vol. 25 (1905),  
p. 186, 1906 (Apia and Pago Pago).—SEALE, Occ. Pap. Bishop Mus., vol. 4,  
No. 1, p. 5, 1906 (Shortland Island, Solomons).—EVERMANN and SEALE, Bull.  
Bur. Fisher., vol. 26 (1906), p. 53, 1907 (Bulan, Bacon).—KENDALL and GOLDS-

BOROUGH, Mem. Mus. Comp. Zool., vol. 26, p. 243, 1911 (Taritari, Gilbert Islands; Arhno; Marshall Islands; Rangiroa, Paumotus).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 20, 1913 (Saleyer, Karakaralong Islands, Lirung, Obi major, between Gisser and Ceram Laut; Gebe).—OGILBY, Mem. Queensland Mus., vol. 5, p. 97, 1916 (Murray Island).—FOWLER, Occ. Pap. Bishop Mus., vol. 8, No. 7, p. 375, 1923 (Honolulu); Bishop Mus. Bull. 22, p. 4, 1925 (Guam).—FOWLER and BALL, Bishop Mus. Bull. 26, p. 6, 1925 (Lisiansky).—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1927, p. 256 (Bacon); Mem. Bishop Mus., vol. 10, p. 29, 1928 (Honolulu, Shortland Island, Fate, Laie Beach, Lisiansky, Guam, Tongatabu, Gilbert Islands, Arhno Atoll, Rangiroa, Kauai).—WHITLEY, Proc. Linn. Soc. New South Wales, vol. 54, p. 92, 1929 (Ontong Java, Lord Howe Group, Melanesia).—MCCULLOCH, Austral. Mus. Mem., vol. 5, p. 37, 1929 (Queensland; South Australia).—FOWLER, Mem. Bishop Mus., vol. 11, No. 5, p. 315, 1931 (reference); Hong Kong Nat., vol. 2, p. 112, 1931 (reference).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 32, 1936 (Fiji, New Hebrides, Solomons).—FOWLER, List Fish. Malaya, p. 24, 1938 (reference).

*Clupea flosmaris* RICHARDSON, Ichth. China Japan, p. 305, 1846 (type locality: Chinese Seas; Canton, Canton River).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 412, 1868 (copied).

*Clupea macassariensis* BLEEKER, Journ. Indian Arch., vol. 3, p. (69) 72, 1849 (type locality: Macassar).

*Clupeoides macassariensis* BLEEKER, Verh. Batav. Genootsch. (Haring.), vol. 24, p. 17, 1852.

*Sardinella sirm* (not Walbaum) JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, 1905, p. 770, 1906 (Negros).

*Sardinella elupcooides* (not Bleeker) JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, 1905, p. 770, 1906 (Negros).

Depth 4 to  $5\frac{1}{2}$ ; head  $2\frac{3}{4}$  to  $4\frac{1}{4}$ , width  $2\frac{1}{8}$  to  $2\frac{4}{5}$ . Snout  $3\frac{1}{5}$  to 4 in head from snout tip; eye 3 to  $3\frac{2}{3}$ , greater than snout to subequal with age, always greater than interorbital; maxillary reaches to or slightly beyond front eye edge, expansion 2 to  $2\frac{1}{8}$  in eye, length  $2\frac{1}{2}$  to 3 in head from snout tip; interorbital  $3\frac{4}{5}$  to  $5\frac{1}{4}$ , little convex. Gill rakers 6 to  $10+21$  to 30, finely lanceolate, little longer than gill filaments or  $\frac{3}{4}$  to eye.

Scales 32 to 36 in median lateral series to caudal base and 3 more on latter; 7 to 9 transverse, 12 to 15 predorsal. Scales with 2 to 7 vertical striae, often irregular.

D. II, 9 or II, 10, first branched ray  $1\frac{2}{3}$  to  $1\frac{3}{4}$  in total head length; A. II, 7, I or II, 8, I, first branched ray 4 to  $4\frac{1}{3}$ ; caudal  $1\frac{2}{3}$  to  $1\frac{4}{5}$ , forked; least depth of caudal peduncle  $2\frac{4}{5}$  to  $3\frac{1}{3}$ ; pectoral  $1\frac{3}{4}$  to  $1\frac{7}{8}$ ; ventral  $1\frac{7}{8}$  to  $2\frac{1}{2}$ .

Back slaty, line of demarcation above eye well contrasted from silvery white of eye and lower surface. Fins pale.

Zululand, Natal, Mauritius, Singapore, East Indies, Philippines, China, Queensland, Lord Howe Island, Melanesia, Micronesia, Polynesia, Hawaii. I cannot but think that Richardson's account, based

on a drawing, must pertain to this fish. The only disagreement is his statement "Length of figure 6 inches" whereas *Stolephorus delicatulus* reaches only 80 mm. This would hardly be an exaggeration of his artist? In life *Stolephorus delicatulus* has the back dark blue, well contrasted with the bright silvery white sides and lower surfaces.

- 3 examples. Atulayan Bay, Luzon. June 17, 1909. Length, 31–48 mm.  
 98 examples. Balalo Bay. Electric light. December 20, 1908. Length, 27–54 mm.  
 1 example. Balamban, Cebu. April 2, 1908. Length, 70 mm.  
 5 examples. Balikias Bay. July 14, 1909. Length, 65–74 mm.  
 9303. Biri Channel. June 1, 1909. Length, 46 mm.  
 8 examples. Bongao Anchorage. February 22, 1908. Length, 42–65 mm.  
 4 examples. Busin Harbor, Burias Island. April 22, 1908. Length, 23–28 mm.  
 45 examples. Cagayan, Sulu Island. January 8, 1909. Length, 33–65 mm.  
 15081, 15082, 15084. Capulaan Bay, Pigbilao Island. February 24, 1909. Length, 64–70 mm.  
 18 examples. Cataingan Bay, Masbate. April 18, 1908. Length, 33–72 mm.  
 19892. Daisy Island, west of Bumbum. January 6, 1910. Length, 52–60 mm. 9 examples.  
 D. 5451. East Point (Batan Island), S.  $38^{\circ}$  E., 8.2 miles (lat.  $13^{\circ}22'22''$  N. long.  $124^{\circ}00'48''$  E.). June 5, 1909. Length, 20 mm.  
 34 examples. Catbalogan, Samar. April 16, 1908. Length, 55–73 mm.  
 3 examples. Cebu market. September 4, 1909. Length, 53–58 mm. [1891.]  
 2 examples. Galera Bay, Mindoro. June 9, 1908. Length, 74–79 mm.  
 7389. Gigoso Point, Quinapundan Bay, Samar. July 28, 1909. Length, 39 mm.  
 26 examples. Grande Island reef. Dynamite. January 8, 1908. Length, 36–72 mm.  
 35 examples. Guijulugan, Negros. April 2, 1908. Length, 28–46 mm.  
 64 examples. Inamuean Bay, Mindanao. August 8, 1909. Length, 57–70 mm.  
 6 examples. Jolo anchorage, Jolo. March 5, 1908. Length, 30–64 mm.  
 7744 to 7749. Jolo market, Jolo. February 12, 1908. Length, 81–84 mm.  
 14684. Langao Point, Luzon. June 24, 1909. Length, 57–68 mm. 13 examples.  
 5727. Little Santa Cruz Island. May 28, 1908. Length, 56 mm.  
 15660, 15661. Mactan Island. March 25, 1909. Length, 55–59 mm.  
 19 examples. Maculabo Island. June 13, 1909. Length, 17–25 mm.  
 7875. Maculabo Island. June 14, 1909. Length, 53–75 mm. 5 examples.  
 1 example. Maleochin Harbor, Malcochin Island. December 18, 1908. Length, 24 mm.  
 27 examples. Mansalay, Mindoro. June 4, 1908. Length, 38–64 mm.  
 16 examples. Maribojac, Bohol. March 25, 1909. Length, 33–57 mm.  
 277 examples. Matnog Bay, Luzon. May 31, 1909. Length, 18–64 mm.  
 1 example. Nogas Point, Panay. February 3, 1908. Length, 60 mm.  
 3 examples. Panubatan Bay, Mindanao. February 5, 1908. Length, 41–60 mm.  
 15651 to 15653. Paron Point, Luzon. June 21, 1909. Length, 58–60 mm.  
 2 examples. Port Dupon, Leyte. March 17, 1909. Length, 41–43 mm.  
 69 examples. Port Galera, Mindoro. June 9, 1908. Length, 28–76 mm.  
 47 examples. Port Jamelo, Luzon. July 13, 1908. Length, 35–63 mm.  
 2 examples. Port Matalvi, Luzon. November 23, 1908. Length, 39–43 mm.  
 4 examples. Port Uson, west of Pinas Island. December 17, 1908. Length, 56–66 mm.  
 4 examples. Romblon Harbor, Romblon. March 25, 1908. Length, 76–83 mm.

- 13 examples. San Miguel Harbor, Ticao Island. April 21, 1908. Length, 20-79 mm.
- 11 examples. San Miguel Harbor, Ticao Island. April 25, 1908. Length, 52-83 mm.
8280. San Miguel Island, Tabaco Bay. June 4, 1909. Length, 40 mm.
22072. Santa Cruz, Marinduque Island. April 24, 1908. Length, 62-72 mm.
- 10 examples. Tataan, Simalue Island. February 10, 1908. Length 60-75 mm.
22623. Tataan anchorage. February 21, 1908. Length, 65-80 mm. 5 examples.
- 10396, 10461, 10462. Tilig, Lubang Island. July 14, 1908. Length, 55-62 mm.
- 34 examples. Tumindao Island, Anchorage. February 25, 1908. Length, 49-86 mm.
- 27 examples. Veradero Bay, Luzon. July 22, 1908. Length, 21-58 mm.
- 1 example. Veradero Harbor, Luzon. July 22, 1908. Length, 21 mm. Damaged.
- 37 examples. Veradero Bay, Luzon. July 23, 1908. Length, 26-68 mm.
- 12933, 14343. Tobea Island. December 14, 1909. Length, 68 mm.
- 8 examples. Tomahu Island. December 11, 1909. Length, 25-39 mm.
- 4 examples. Tomahu Island. December 12, 1909. Length, 58-70 mm.
19892. Daisy Island, west of Bumbum. January 6, 1910. Length, 60 mm.
- 12 examples. Langao Point. June 24, 1909. Length, 57-68 mm.
- 4 examples. Maculabo Islands. June 14, 1909. Length, 53-75 mm.
- 20 examples. Powatik Harbor, Makyan Island. November 29, 1909. Length, 53-58 mm.
- U.S.N.M. No. 51956. Negros, Philippines. Dr. Bashford Dean. Length, 38-40 mm., caudal ends broken. 2 examples. As *Sardinella clupeoides*.
- U.S.N.M. No. 52028. Negros, Philippines. Dr. Bashford Dean. Length, 62 mm. As *Sardinella sirm*.
- U.S.N.M. No. 52237. Apia, Samoa. Bureau of Fisheries (07546). Length, 31-50 mm. 12 examples.
- U.S.N.M. No. 56062. Bacon, Philippines. Bureau of Fisheries (4009). Length, 38-52 mm. 37 examples.
- U.S.N.M. No. 56254. Bulan, Philippines. Bureau of Fisheries (8756). Length, 43-66 mm. 5 examples.
- U.S.N.M. No. 66042. Gilbert Islands. *Albatross* collection. 15 examples.
- U.S.N.M. No. 66043. Arhno Atoll. *Albatross* collection. 49 examples.
- U.S.N.M. No. 66044. Rangiroa, Paumotus. *Albatross* collection. 2 examples.
- U.S.N.M. No. 83005. Tongatabu. Length 32 and 33 mm. 4 examples.
- A.N.S.P. Bacon, Philippines. Bureau of Fisheries. Length, 50-62 mm. 7 examples.

#### STOLEPHORUS ALBURNUS (Kner)

*Alausa alburnus* KNER, Sitz. Ber. Akad. Wiss. Wien, math.-nat. Kl., vol. 54, p. 387, pl. 1, fig. 16, 1866 (type locality: "Valparaiso, Chile").—SCHMELTZ, Cat. Mus. Godeffroy, No. 4, p. 25, 1869 (Samoa).

*Spratelloides alburnus* SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 37, 1874 (Samoa); No. 7, p. 58, 1879 (Samoa).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Samoa).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 384, 1909 (Samoa).

*Stolephorus alburnus* FOWLER, Mem. Bishop Mus., vol. 10, p. 29, 1928 (compiled); vol. 11, p. 315, 1931 (reference).

Depth  $5\frac{1}{3}$ ; head  $3\frac{4}{5}$ . Snout  $3\frac{2}{5}$  in head from snout tip; eye  $3\frac{2}{5}$ , equals snout; maxillary reaches front eye edge, length  $2\frac{1}{2}$  in head from snout tip; no teeth; interorbital  $\frac{2}{3}$  eye diameter, level.

Scales 36 in median lateral series to caudal base and 2 more on latter; 6 transversely, about 16 predorsal. Scales small on breast and at pectoral base. Fins, except caudal base, scaleless.

D. I, 11 (11 or 12 in description), second branched ray  $1\frac{1}{2}$  in total head length; A. 12 (11 or 12 in description), fin length 2; caudal  $1\frac{2}{5}$ , little concave behind; least depth of caudal peduncle 3; pectoral  $1\frac{3}{4}$ ; ventral  $2\frac{1}{4}$ .

Back dark, sides and below whitish, without silvery lateral band. Fins uniform. Length, 51 mm. (Kner.)

Samoa. Not seen since originally described.

#### STOLEPHORUS ROBUSTUS (Ogilby)

*Spratelloides robustus* OGILBY, Proc. Linn. Soc. New South Wales, vol. 22, p. 64, 1897 (type locality: "Coast of New South Wales" [=Maroubra]).

*Stolephorus robustus* WAITE, Mem. New South Wales Nat. Club, No. 2, p. 12, 1904; Rec. Austral. Mus., vol. 6, pt. 3, p. 195, 1906 (Queenscliffe).—OGILBY, Ann. Queensland Mus., No. 9, p. 5, 1908 (Southport River); Commercial Fish. Fisher. Queensland, p. 47, 1915; Mem. Queensland Mus., vol. 5, p. 98, 1916 (South Queensland coast).—MCCULLOCH, Rec. Austral. Mus., vol. 13, pt. 2, p. 42, pl. 11, fig. 1, 1920 (Sydney and Port Hacking; Bulwer, Queensland; Queenscliffe, Victoria; Tasmania).—WAITE, Rec. South Austral. Mus., vol. 2, p. 38, fig. 55, 1921.—MCCULLOCH and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—WHITLEY, Australian Zoologist, vol. 4, p. 228, 1926 (North West Islet, ejected by white-capped noddies).—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 16, pl. 4, fig. 51a, 1927.—WHITLEY, Rec. Australian Mus., vol. 16, p. 4, 1927 (Michaelmas Key, North West Islet, Moreton Bay; Port Hacking and Shellharbor, New South Wales; Queenscliffe; off Derwent River, Tasmania; types).—MCCULLOCH, Australian Mus. Mem., vol. 5, p. 37, 1929 (reference).

*Spratelloides delicatulus* (not Bennett) ZIETZ, Trans. Roy. Soc. South Australia, vol. 32, p. 295, 1908.

Depth 5 to  $5\frac{1}{2}$ ; head  $3\frac{3}{4}$  to  $4\frac{1}{5}$ , width  $2\frac{2}{5}$  to  $2\frac{3}{4}$ . Snout  $3\frac{1}{3}$  to  $3\frac{1}{2}$  in head from snout tip; eye 3 to  $3\frac{4}{5}$ , 1 to  $1\frac{1}{8}$  in snout, greater than interorbital; maxillary reaches  $\frac{1}{5}$  to  $\frac{1}{4}$  in eye, expansion 2 to  $2\frac{1}{4}$ , length  $2\frac{3}{5}$  to  $2\frac{7}{8}$  in head from snout tip; no teeth; interorbital  $4\frac{1}{5}$  to  $4\frac{1}{4}$ , but slightly elevated, largely level, sides and top of head with some venous. Gill rakers  $12+28$ , lanceolate,  $1\frac{1}{4}$  in eye; gill filaments  $\frac{2}{3}$  gill rakers.

Scales 36 to 40 in median lateral series to caudal base and 3 or 4 more on latter, narrowly imbricated; 9 transversely, 14 predorsal. Axillary ventral scale half fin length. Scales with 1 or 2 transverse vertical striae, of which only one may be complete; circuli as parallel vertical close set striae, none apical.

D. II, 9, first branched ray  $1\frac{2}{5}$  to  $1\frac{1}{2}$  in total head length; A. II, 7, first branched ray  $3\frac{1}{5}$  to  $3\frac{1}{4}$ ; caudal  $1\frac{1}{8}$  to  $1\frac{1}{5}$ , moderately forked, lobes broad; least depth of caudal peduncle  $2\frac{3}{5}$  to  $3\frac{1}{8}$ ; pectoral  $1\frac{3}{5}$  to  $1\frac{4}{5}$ ; ventral  $1\frac{2}{3}$  to  $1\frac{3}{4}$ .

Back neutral dusky to brown, sides and below silvery white. Iris white. Dorsal and caudal pale brownish, lower fins whitish.

Queensland, New South Wales, Victoria, Tasmania.

U.S.N.M. No. 48824. Port Jackson. J. D. Ogilby. Length, 50–86 mm. 6 examples. Cotypes [paratypes]? of *Spratelloides robustus*.

**STOLEPHORUS JAPONICUS (Houttuyn)**

*Atherina japonica* HOUTTUYN, Verh. Holland. Maatsch. Haarlem, vol. 20, p. 340, 1782 (type locality: Japan).—GMELIN, Syst. Nat. Linn., vol. 1, p. 1397, 1789 (Japan).—SCHNEIDER, Syst. Ichth. Bloch, p. 111, 1801 (copied).

*Stolephorus japonicus* LACÉPÈDE, Hist. Nat. Poiss., vol. 5, pp. 381, 382, 1803 (Japan).—JORDAN and SEALE, Proc. U. S. Nat. Mus., vol. 28, p. 770, 1905 (Negros).—SMITH and POPE, Proc. U. S. Nat. Mus., vol. 31, p. 462, 1906 (Susaki).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 629, 1906 (Wakanoura, Nagasaki, Heda, Osaka).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 403, 1912 (Nagasaki).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 184, 1920 (Tokyo market).—FOWLER, Mem. Bishop Mus., vol. 10, p. 30, 1928 (compiled); vol. 11, No. 5, p. 315, 1931 (reference).—SCHMIDT, Trans. Pacific Comm. Acad. Sci. U.S.S.R., vol. 11, p. 19, 1931 (Nagasaki).—HERRE, Field Mus. Nat. Hist. Publ. 353, zool. ser. vol. 21, p. 33, 1936 (Tahiti).

*Spratelloides japonicus* MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan, Korea).—TANAKA, Jap. Fish. Life Colours, No. 47, 1933.

*Engraulis commersonianus* (not Lacépède) RICHARDSON, Ichth. China Japan, p. 308, 1846 (compiled).

*Clupea gracilis* SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 238, pl. 108, fig. 2, 1846 (type locality: Southeast coasts of Nagasaki).

*Spratelloides gracilis* BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 18, 1853; Atlas Ichth. Ind. Néerland., vol. 6, p. 96, pl. (8) 266, fig. 2, 1866–72 (Celebes and Ternate).—GÜNTHER, Cat. Fishes British Mus., vol. 6, p. 465, 1868 (Japan; type of *Clupea argyrotaenia*).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 601, 1871 (Red Sea).—SCHMELTZ, Cat. Mus. Godeffroy, No. 5, p. 37, 1874 (Viti Levu).—MARTENS, Preuss. Exped. Ost-Asien, vol. 1, p. 405, 1876 (Nagasaki).—SCHMELTZ, Cat. Mus. Godeffroy, No. 7, p. 58, 1879 (Viti Levu).—PÖHL, Cat. Mus. Godeffroy, No. 9, p. 39, 1884 (Viti Levu).—OGILBY, Mem. Australian Mus., vol. 2, p. 72, 1889 (Lord Howe Island).—ISHIKAWA and MATSUURA, Prelim. Cat. Fish. Mus. Tokyo, p. 8, 1897.—STEINDACHNER, Abh. Senek. Ges., vol. 25, p. 456, 1900 (Ternate and Batjan).—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 53, 1901 (southeast Japan).—BORSIERI, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 4, p. 218, 1904 (Nocra).—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 384, 1909 (Fiji).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 20, fig. 12, 1913 (Kangeang Islands; Obi Major; Nusa Laut; Banda).—HERRE, Journ. Pan-Pacific Res. Inst., vol. 8, No. 4, p. 6, 1933 (Dumaguete).—HARDENBERG, Treubia, vol. 14, livr. 2, p. 215, 1933 (Temiang Island, Lingga Archipelago, Sumatra).—GRUVEL and CHABANAUD, Mém. Inst. Egypte, vol. 35, p. 4, 1937 (Gulf of Suez).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 23, 1937 (Dumaguete).

*Stolephorus gracilis* EVERMANN and SEALE, Bull. Bur. Fisher., vol. 26, (1906), p. 53, 1907 (Bacon).—FOWLER, List Fish. Malaya, p. 24, 1938 (reference).

*Clupea argyrotaeniata* BLEEKER, Journ. Indian Arch., vol. 3, p. 72, 1849 (type locality, Macassar, southwest Celebes).

*Clupea argyrotaenia* REGAN, Trans. Zool. Soc. London, vol. 20, pt. 6, p. 276, 1914 (Mimika River, New Guinea).

Depth  $6\frac{1}{5}$  to  $6\frac{1}{2}$ ; head 4 to  $4\frac{1}{3}$ , width  $2\frac{1}{2}$  to 3. Snout 3 to  $3\frac{1}{5}$  in head from snout tip; eye  $3\frac{2}{5}$  to  $3\frac{4}{5}$ ,  $1\frac{1}{8}$  to  $1\frac{1}{4}$  in snout,  $\frac{1}{3}$  to  $\frac{1}{2}$  greater than interorbital; adipose lid rather narrow along hind eye edge; maxillary reaches  $\frac{1}{8}$  to  $\frac{1}{5}$  in eye, expansion  $1\frac{1}{2}$  to  $1\frac{3}{4}$  in eye, length  $2\frac{3}{5}$  to  $2\frac{2}{3}$  in head from snout tip; no teeth; interorbital  $5\frac{1}{3}$  to  $6\frac{1}{4}$ , nearly level; sides and top of head venulose. Gill rakers  $18+28$ , finely lanceolate, twice gill filaments or  $1\frac{1}{3}$  in eye.

Scales (pockets) 36 in median lateral series to caudal base and 4 more on latter; 8 scales transversely, 13 predorsal. Scales with 2 or 3 transverse radiating striae, often connected at middle of scale; circuli partly concentric, basal, none apical.

D. III, 11 or III, 10, first branched ray  $1\frac{3}{5}$  to  $1\frac{2}{3}$  in head; A. II, 12 or II, 11, first branched ray 4 to  $4\frac{1}{5}$ ; caudal  $1\frac{1}{3}$  to  $1\frac{2}{5}$ , well forked, lobes pointed; least depth of caudal peduncle  $3\frac{7}{8}$  to 4; pectoral  $1\frac{3}{4}$  to  $1\frac{7}{8}$ ; ventral 2 to  $2\frac{1}{8}$ .

Back light brownish, under surfaces still paler. Side of head and iris silvery white. Broad silvery white lateral band, expanding over anal until wide as eye, its upper edge bounded all along by neutral gray line. Dorsal and caudal pale brownish, lower fins still paler to whitish.

Red Sea, East Indies, Philippines, Japan, Korea, Lord Howe Island, Polynesia.

7 examples. Bongao anchorage. Electric light. February 22, 1908. Length, 33–44 mm.

5 examples. Bulan Island, Sanaleo Group. Electric light. September 13, 1909. Length, 35–54 mm.

7 examples. Busin Harbor, Burias Island. April 23, 1908. Length, 33–40 mm.

46 examples. Grande Island reef. Dynamite. January 8, 1908. Length, 23–48 mm.

19 examples. Isabella Basilan. September 11, 1909. Length, 40–68 mm.

3 examples. Jolo. Electric light. February 7, 1908. Length, 40–46 mm.

1 example. Luceña anchorage. Electric light. February 24, 1909. Length, 43 mm.

5 examples. Matnog Bay. Seine 150 feet. May 31, 1909. Length, 58–67 mm.

11 examples. Murcielagos Bay, Mindanao. August 21, 1909. From stomach of No. 9340. Length 45–57 mm. (?)

14 examples. Occidental Negros. January 22, 1909. Length, 52–58 mm.

204 examples. Philippines. Length, 38–55 mm.

144 examples. Port Matalvi, Luzon. November 23, 1908. Length, 33–57 mm.

27 examples. San Miguel Harbor, Tieao Island. April 21, 1908. Length, 31–53 mm.

1 example. Santa Cruz Island, Marinduque Island. April 24, 1908. Length, 34 mm.

- 4 examples. Tataan Island, Tawi Tawi Group. February 21, 1908. Length, 41–53 mm.
- 1 example. Tumindao Island anchorage. Electric light. February 26, 1908. Length, 40 mm.
- 5 examples. Varadero Bay, Mindoro. Electric light. July 22, 1908. Length, 26–37 mm.
- 6 examples. Varadero Bay. Electric light. July 23, 1908. Length, 25–52 mm.
- U.S.N.M. No. 52019. Negros, Philippines. Dr. Bashford Bean. Length, 50–54 mm. 3 examples.
- U.S.N.M. No. 56169. Baeon, Philippines. Bureau of Fisheries (3501). Length, 57 mm.
- U.S.N.M. No. 59785. Susaki, Japan. Dr. H. M. Smith. Length, 77–78 mm. 2 examples.
- U.S.N.M. No. 62342. Nagasaki, Japan. Jordan and Snyder. Length, 60–94 mm. 50 examples.
- U.S.N.M. No. 70781. Kagoshima, Japan. Albatross collection 1906. Length, 79–94 mm. 10 examples.
- U.S.N.M. No. 87648. Tahiti, Society Islands. J. M. Clements. Length, 33 mm.

#### STOLEPHORUS MADAGASCARIENSIS (Sauvage)

*Spratelloides madagascariensis* SAUVAGE, Bull. Soc. Philom. Paris, 1882, p. 160 (type locality: Madagascar); Hist. Nat. Madagascar, Poiss., p. 496, pl. 48, fig. 2, 1891 (type).

*Spratelloides aestuarius* GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 55, fig., 1913 (type locality: Zwartkops River, Port Elizabeth; tidal rivers East London; Princess Vlei, Cape Peninsula).—REGAN, Ann. Durban Mus., vol. 1, p. 167, 1916 (Durban).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 296, 1917 (reference).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 109, 1925 (False Bay, Port Elizabeth, East London, Natal).

*Gilchristella aestuarius* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 365, fig. 4, 1935 (Blue lagoon, Natal).

Depth 5; head  $3\frac{3}{4}$ . Snout  $3\frac{3}{4}$  in head from snout tip; eye 4,  $1\frac{1}{10}$  in snout; maxillary reaches front eye edge, length  $2\frac{3}{5}$  in head from snout tip; mandible apparently slightly protruded; interorbital low, scarcely elevated.

Scales 38 in median lateral series to caudal base and 2 more on latter; 9 transversely, about 19 predorsal.

D. III, 13, first branched ray  $1\frac{1}{3}$  in total head length, origin slightly behind ventral origin; A. 16 branched rays (description gives A. 19), fin length  $1\frac{1}{4}$  in head, first branched ray  $3\frac{1}{2}$ ; caudal  $3\frac{1}{5}$  in combined head and body to caudal base, well forked, long lobes pointed; least depth of caudal peduncle  $2\frac{7}{8}$  in head; pectoral  $1\frac{1}{3}$ ; ventral  $1\frac{7}{8}$ .

Brownish, broad silvery band from head to caudal. Length, 60 mm. (Sauvage.)

South Africa, Natal, Madagascar. Though I have identified the South African form with the present species the figure by Sauvage differs a little from his description. Possibly owing to an artist's mistake ?, the belly shows 9 preventral denticles and 7 postventral!

Barnard describes *Spratelloides aestuarius* with depth of body equal to length of head, 4 to  $4\frac{1}{5}$  in length, A. 18 to 21 and beginning under end of dorsal and ventral wholly in front of dorsal.

A.N.S.P., eight examples. Blue lagoon, in enclosed water. August 2, 1933.  
H. W. Bell-Marley. Length, 44–51 mm.

### Genus DUSSUMIERIA Valenciennes

*Dussumieria* VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 467, 1847. (Type, *Dussumieria acuta* Valenciennes, monotypic.)

Body elongate, more or less compressed. Snout pointed. Eyes with very thin, wide, adipose lids. Jaws equal. Mouth bordered by very small premaxillary and maxillary, latter with 2 supplemental bones. Small teeth in jaws, in villiform patches on palatines, pterygoids and tongue, none on vomer. Gill membranes separate and free from isthmus. Pseudobranchiae large. Branchiostegals 15 to 20, very fine. Scales moderate, thin, very deciduous. Dorsal opposite ventrals, origin of fin nearer caudal than end of snout. Anal small, far behind dorsal.

Chabanaud has described and figured a fish which he refers to the present genus, though its entirely different appearance suggests the Atherinidae. This is seen in the elevated pectoral, the opposed posterior second dorsal and anal, and advanced ventral. The first dorsal is unique in that it is well premedian in the body, over the ventral, and composed of a spine and 5 branched rays. It may be found as follows:

#### DUSSUMIERIA PRODUCTISSIMA Chabanaud

*Dussumieria productissima* CHABANAUD, Bull. Inst. Océanogr. Monaco, No. 627, p. 4, fig. 3 (tongue), p. 4 (gill raker), pp. 5–6 (scales), 1933 (type locality: Gulf of Suez; Grand Lac Amer, Isthmus of Suez; Lac Timsah, Isthmus of Suez); Bull. Soc. Zool. France, vol. 58, p. 289, 1933 (above materials).—GRUVEL and CHABANAUD, Mém. Inst. Égypte, vol. 35, p. 3, fig. 3, 1937 (types).

Gruvel and Chabanaud say it is more elongate than *Dussumieria hasseltii* Bleeker, has more numerous gill rakers (29 to 34 in place of 19 to 24), also more numerous anal rays (17 to 19 in place of 16).

#### ANALYSIS OF SPECIES

- |  |           |
|--|-----------|
| <i>a<sup>1</sup>.</i> Lateral scales 40 to 42----- | acuta     |
| <i>a<sup>2</sup>.</i> Lateral scales 52 to 56----- | hasseltii |

#### DUSSUMIERIA ACUTA Valenciennes

*Dussumieria acuta* VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 467, pl. 606, 1847 (type locality: Bombay, Coromandel).—CANTOR, Journ. Asiatic Soc. Bengal, vol. 18, p. 1268, 1849 (Pinang, Malay Peninsula, Singapore).—JERDON, Madras Journ. Lit. Sci., vol. 17, p. 145, 1851.—BLEEKER, Verh. Batav. Genootsch. (Bengal), vol. 25, p. 73, 1853 (reference).—KNER, Reise Novara, Fische, p. 330, 1865 (Java and Manila).—DAY, Fishes of Malabar, p. 226, 1865.—GÜNTHER,

Cat. Fish. Brit. Mus., vol. 7, p. 466, 1868 (Sarawak and Pinang).—BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 94, pl. (13) 271, fig. 1, 1866–72 (Java, Sumatra, Pinang, Singapore, Bintang, Banka, Borneo, Celebes, Batjan, Amboina); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 275, 1868 (Obi Island); Nederl. Tijdschr. Dierk., vol. 4, p. 118, 1874 (Chinese drawing).—DAY, Fishes of India, pt. 4, p. 647, pl. 166, fig. 4, 1878 (Sind, India, Malabar).—BLEEKER, Verh. Akad. Wet. Amsterdam, vol. 18, p. 3, 1879 (China).—MACLEAY, Proc. Linn. Soc. New South Wales, vol. 8, p. 278, 1884 (Hood Bay, New Guinea).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, math. nat. kl., vol. 71, pt. 1, p. 157, 1907 (Gischin).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Pelaboen Ratoe, Java).—WEBER, *Siboga* Exped., Fische, vol. 57, p. 3, 1913 (Macassar).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 21, fig. 13, 1913 (Batavia).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 62, p. 2, 1923 (Cebu).—HORA, Mem. Asiatic Soc. Bengal, vol. 6, p. 481, 1924 (Singora).—CHABANAUD, Service Océanogr. Pêches Indo-Chine, 1<sup>e</sup> Note, p. 7, 1926 (Gulf of Siam).—VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 622, 1926 (Sarawak).—FOWLER, Mem. Bishop Mus., vol. 10, p. 30, 1928 (copied).—PILLAY, Journ. Bombay Nat. Hist. Soc., vol. 33, No. 2, p. 355, 1929 (Travancore).—TIRANT, Service Océanogr. Pêches Indo Chine, 6<sup>e</sup> Note, p. 122, 1929 (Cochin China).—DERANIYAGALA, Spoilia Zeylanica, vol. 15, p. 33, 1929.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1929, p. 598, 1930 (Hong Kong); Hong Kong Nat., vol. 2, p. 113, 1931 (reference).—DERANIYAGALA, Ceylon Journ. Sci., vol. 5, p. 82, 1933.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, p. 69, 1934 (Sanoer, Bali).—ROXAS, Philippine Journ. Sci., vol. 55, p. 251, pl. 1, fig. 5 (scale), 1934 (Orani; Manila).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 90, 1935 (Paknam; Bangkok); vol. 89, p. 130, 1937 (Paknam; Tachin).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 22, 1937 (reference).—SUVTI, Index Fish. Siam, p. 12, 1937 (reference).—FOWLER, List Fish. Malaya, p. 24, 1938 (reference).

*Dussumieriella elopsoidea* BLEEKER, Vehr. Batav. Genootsch. (Madura), vol. 22, p. 12, 1849 (type locality: Madura Straits near Kammal and Surabaya, Java); Versl. Meded. Akad. Wet. Amsterdam, ser. 2, vol. 2, p. 294, 1868 (Rio, Bitang), p. 300, 1868 (Waigiu).—GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 466, 1868 (type; part).

Depth  $3\frac{7}{8}$ ; head  $3\frac{2}{3}$ , width  $2\frac{2}{5}$ . Snout  $3\frac{3}{5}$  in head from snout tip; eye  $3\frac{3}{5}$ , 1 in snout, greater than interorbital, adipose lids narrow and marginal; maxillary reaches  $\frac{4}{5}$  to snout, expansion  $1\frac{3}{4}$  in eye, length  $3\frac{1}{10}$  in head from snout tip; no teeth; interorbital 4, but slightly elevated, level; side of head, occiput and humeral region venulose. Gill rakers 11+21, lanceolate,  $\frac{7}{8}$  of gill filaments or  $\frac{1}{2}$  in eye.

Scales (fallen) 48 in median lateral series to caudal base and 7 more on latter; 12 transversely, 23 predorsal. Scales with 5 transverse vertical complete striae and 6 short marginals basally; circuli as fine transverse vertical striae, none apical.

D. III, 12, first branched ray  $1\frac{4}{5}$  in head; A. III, 13, I, first branched ray  $3\frac{1}{5}$ ; caudal 1, deeply forked, lobes narrowly triangular; least depth of caudal peduncle 3; pectoral  $1\frac{2}{3}$ ; ventral  $2\frac{1}{5}$ .

Back drab-brown, also occiput. Side of body, head, and under surface paler brown. Dorsal and caudal pale brown, lower fins whitish. Iris grayish.

Red Sea, India, Malay Peninsula, Singapore, Pinang, East Indies, Philippines, China.

2 examples. Jolo. Electric light. February 7, 1908. Length, 28 mm.

20158. Jolo market. February 11, 1908. Length, 84 mm.

1 example. Sebatic Island, Borneo. October 1, 1909. Length, 68 mm.

3 examples. Varadero Bay, Mindoro. July 23, 1908. Length, 21-23 mm.

1 example. Varadero Harbor. Electric light. July 22, 1908. Length, 40 mm.

1 example. D. 5561. September 19, 1909. Length, 18 mm.

U.S.N.M. No. 72494. Palaboean Ratoe, Wynkoops Bay, Java. October 1909. Bryant and Palmer. Length, 158 mm. Very poor specimen.

U.S.N.M. No. 84176. Philippine Islands. Dr. Fred Baker. Length, 140 mm.

#### DUSSUMIERIA HASSELTII Bleeker

*Dussumieria hasseltii* BLEEKER, Nat. Tijds. Nederland, Indië, vol. 1, p. 422, 1850 (type locality: Batavia, Cheribon, Samarang, Surabaya); Verh. Batav. Genootsch. (Chirocent.), vol. 24, p. 13, 1852; Atlas Ichth. Ind. Néerland., vol. 6, p. 95, pl. (13) 271, fig. 2, 1866-72 (Java, Madura, Sumatra, Singapore, Celebes, Batjan, Obi-major, Amboina).—DAY, Fishes of India, pt. 4, p. 647, pl. 166, fig. 5, 1878 (Canara, Coromandel); Fauna British India, Fishes, vol. 1, p. 399, 1889.—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27, 1907, p. 236, 1908 (Manila).—BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 590, 1912 (Batavia).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 23, 1913 (Batavia, Banjwangi, Balikpapan, Lombok).—OGILBY, Mem. Queensland Mus., vol. 3, p. 134, 1915 (Cape York); vol. 5, p. 98, 1916 (Cape York).—FOWLER, Copeia, No. 58, p. 62, 1918 (Philippines); Journ. Bombay Nat. Hist. Soc., vol. 30, No. 1, p. 39, 1924 (Calicut).—DELSMAN, Treubia, vol. 6, p. 297, 1925 (young).—MCCULLOCII and WHITLEY, Mem. Queensland Mus., vol. 8, pt. 2, p. 131, 1925 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 256, 1927 (San Fernando; Orani; Orion).—FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 71, p. 1, 1927 (Benkoelen, Sumatra).—McCULLOCH, Australian Mus. Mem., vol. 5, p. 37, 1929 (Queensland).—TIRANT, Service Océanogr. Pêches Indo-Chine, 6<sup>e</sup> Note, p. 122, 1929 (Cochinchina).—HARDENBERG, Treubia, vol. 13, livr. 1, p. 100, 1931 (Bagan Si Api Api).—FOWLER, Hong Kong Nat., vol. 2, p. 113, 1931 (reference).—CHEVEY, Inst. Océanogr. Indochine, 19<sup>e</sup> Note, p. 8, 1932 (Cochin China).—HERRE, Fishes Herre Philippine Exped. 1931 p. 14, 1934 (Gulf of Lingayen; Unisan; La Paz; Cebu).—ROXAS, Philippine Journ. Sci., vol. 55, p. 252, pl. 1, fig. 2 (scale), 1934 (Luzon; Samar; Panay; Guimaras).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 22, 1937 (reference).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 12, 1937 (Singapore; near Malacca; Kuala Muda, Kedah).—FOWLER, List Fish. Malaya, p. 24, 1938 (reference).

*Dussumieria hasseltii* WEBER, Siboga Exped., vol. 57, Fische, p. 3, 1913 (Salyer).—HORA and MUKERJI, Rec. Indian Mus., vol. 38, p. 18, 1936 (Maungmagan, Burma).

*Dussumieria elopsooides* (not Bleeker) GÜNTHER, Cat. Fish. Brit. Mus., vol. 7, p. 466, 1868 (part; Amboyna; Amoy).—MEYER, Anal. Soc. Espa  . Hist. Nat., Madrid, vol. 14, p. 42, 1885 (Manila Bay).—ELERA, Cat. Fauna Filip., vol. 1, p. 584, 1895 (Luzon; Manila).—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., vol. 25, p. 328, 1902 (Kotosho).—D  NCKER, Mitt. Naturhist. Mus. Hamburg, vol. 21, p. 186, 1904 (Kuala Lumpur).—FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang).—JORDAN and SEALE, Bull. Bur. Fisher., vol. 26, 1906, p. 5 (1907) (Cavite).—JORDAN and RICHARDSON, Bull. Bur. Fisher., vol. 27, 1907, p. 236, 1908 (Iloilo); Mem., Carnegie Mus., vol. 4, p. 166, 1909 (copied Jordan and Evermann, 1902).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (Padang examples).

*Elops javanicus* (Kuhl and Van Hasselt) BLEEKER, Atlas Ichth. Ind. N  erland., vol. 6, p. 95, 1866–72 (name in synonymy).

*Dussumieria acuta* (part) DAY, Fishes of India, pt. 4, p. 647, 1878 (copied).

Depth 5 to  $5\frac{1}{2}$ ; head  $3\frac{1}{4}$  to  $3\frac{3}{4}$ , width  $2\frac{2}{5}$  to  $2\frac{2}{3}$ . Snout 3 to  $3\frac{1}{10}$  in head from snout tip; eye  $3\frac{3}{5}$  to  $3\frac{3}{4}$ ,  $1\frac{1}{8}$  to  $1\frac{1}{6}$  in snout, greater than interorbital, adipose lids moderate; maxillary not or quite reaches eye, expansion 3 to  $3\frac{1}{4}$  in eye, length 3 to  $3\frac{1}{5}$  in head from snout tip; row of rather long, slender, uniform teeth in each jaw, also extend along each maxillary edge, on palatines and down tongue medially; interorbital 4 to  $4\frac{2}{3}$ , broadly convex; opercle and sides of head smooth. Gill rakers 12+26, finely lanceolate, slender, longer than gill filaments or  $\frac{1}{2}$  of eye.

Scales 45 in median lateral series to caudal base and 4 more on latter; 12 scales transversely, 24 predorsal. Scales very caducous. Scales with 3 or 4 vertical parallel striae; 8 to 11 basal radiating striae and 15 to 20 apical marginal striae; circuli fine.

D. iv, 14, 1 to iv, 16, 1, first branched ray 2 to  $2\frac{1}{5}$  in total head length; A. iii, 12, 1, first branched ray 4 to  $6\frac{1}{4}$ ; caudal 1 to  $1\frac{1}{3}$ , well forked, slender lobes pointed, equal; least depth of caudal peduncle  $2\frac{2}{3}$  to  $3\frac{2}{3}$ ; pectoral 2 to  $2\frac{1}{10}$ ; ventral  $2\frac{1}{5}$  to  $2\frac{2}{3}$ .

Pale brownish, back dusky above, also dusky line from shoulder to caudal base medianly. Iris and side of head silvery white. Fins pale, dorsal lobes dusky terminally.

India, Malay Peninsula, Singapore, East Indies, Philippines, Formosa, China, Queensland.

U.S.N.M. No. 72495. Batavia, Java. Bryant and Palmer. 1909. Length, 147 mm.

U.S.N.M. No. 72496. Batavia, Java. Bryant and Palmer. 1909. Length, 82 mm.

U.S.N.M. No. 72497. Batavia, Java. Bryant and Palmer. 1909. Length, 90 mm.

U.S.N.M. No. 72498. Batavia, Java. Bryant and Palmer. 1909. Length, 89–118 mm. 7 examples.

2 examples. A.N.S.P. Calicut, India. James Hornell. Length, 95–97 mm.

1 example. A.N.S.P. Padang, Sumatra. A. C. Harrison and H. M. Hiller.

Length, 176 mm. When fresh in arrack faded, back bluish slatey, darker above, sides and lower surface silvery. Head mostly silvery. Fins pale, pectoral with rudimentary ray dusky at base.

The following young clupeids are likely the present species:

1 example. Balamban, Cebu. April 2, 1908. Length, 25 mm.

1 example. Busin Harbor, Burias Island. April 22, 1908. Length, 22 mm.

1 example. San Vicente Harbor, Luzon shore. November 13, 1908. Length, 27 mm.

#### Genus ETRUMEUS Bleeker

*Etrumeus* BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. 58, 1853.  
(Type, *Clupea micropus* Schlegel, monotypic.)

*Perkinsia* ROSA SMITH, Amer. Nat., Feb. 1891, p. 153. (Type, *Perkinsia othonops* Rosa Smith, monotypic.)

*Montalbania* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 244, 1934.  
(Type, *Etrumeus albulina* Fowler, orthotypic.)

Body rather elongate, scarcely compressed. Eye entirely covered with adipose lids. Mouth moderately wide, terminal. Supplementary maxillary very rounded. Teeth sparse on maxillary and lower jaws; patches of villiform teeth on vomer, pterygoids and tongue. Gill rakers long. Pseudobranchiae present. Branchiostegals 15. Scales cycloid, entire, very deciduous. Anal rays 9 to 11, rays very short and low and last one slightly enlarged. Ventral entirely behind dorsal.

Species few, without a silvery lateral band.

#### ANALYSIS OF SPECIES

- |  |                 |
|--|-----------------|
| <i>a<sup>1</sup>.</i> MONTALBANIA. Body deeper, depth 4½ to 5; gill rakers 15+25; lateral scales 40 to 42-----                 | <i>albulina</i> |
| <i>a<sup>2</sup>.</i> ETRUMEUS. Body more elongate, depth 5½ to 7; gill rakers 13 to 16+33 to 36; lateral scales 44 to 56----- | <i>micropus</i> |

#### Subgenus MONTALBANIA Fowler

Distinguished from subgenus *Etrumeus* by its deeper body, slightly larger scales and fewer gill rakers.

For Heraclio R. Montalban, in appreciation of his studies on Philippine fishes.

#### ETRUMEUS ALBULINA Fowler

#### FIGURE 14

*Etrumeus albulina* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 244, fig. 7, 1934 (type locality: Iloilo, Philippines; East Indies).—ROXAS and MARTIN, Dep. Agr. Comm. Manila Tech. Bull. 6, p. 23, 1937 (reference).

Depth 4¾ to 5; head 3⅓ to 3⅔, width 2½ to 2⅔. Snout 2⅓ to 3 in head measured from snout tip; eye 3 to 3⅔, 1⅓ to 1⅔ in snout, greater than interorbital; maxillary reaches ⅔ to ⅔ to eye, expansion 3 to 3½ in eye, length 2⅔ to 3⅔ in head from snout tip; teeth fine,

simple, slender, uniserial in jaws, those on each side of mandible little larger; row of small fine teeth on each palatine, none on vomer; interorbital  $4\frac{1}{3}$  to 5, level; side and top of head, finely and rather feebly venulose. Gill rakers 15+25, finely lanceolate,  $\frac{1}{2}$  eye; gill filaments  $\frac{3}{4}$  of gill rakers.

Scales very caducous, fallen from most all specimens, 40 to 42 (pockets) in median lateral series to caudal base and 3 or 4 more on latter; 15 or 16 transversely, 23 to 28 predorsal. Scales with basal half with 3 or 4 short, marginal, basal striae; apically without fine transverse parallel striae or circuli but membranous outer portion with 25 to 30 horizontal parallel fine marginal striae.

D. iv, 13, I or IV, 14, I, first branched ray 2 to  $2\frac{1}{8}$  in total head length; A, II, 11, I to II, 14, I, first branched ray  $5\frac{1}{2}$  to  $6\frac{2}{3}$ ; caudal 1 to  $1\frac{1}{8}$ , deeply forked and lobes sharply pointed; least depth of caudal peduncle  $3\frac{1}{5}$  to  $3\frac{1}{4}$ ; pectoral  $1\frac{3}{5}$  to  $1\frac{3}{4}$ ; ventral  $2\frac{3}{4}$  to  $2\frac{4}{5}$ .

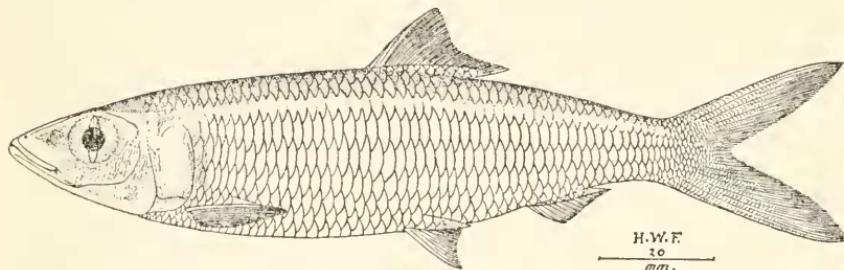


FIGURE 14.—*Etrumeus albulina* Fowler: Type (U.S.N.M. No. 93136).

Back uniform drab brown till level with upper eye edge, line of demarcation sharp from brilliant silvery white of body, sides of head and body. Snout rather pale brown, tip and mandible tip dusky. Dorsal and caudal pale brownish. Anal and paired fins whitish.

Differs from *Etrumeus micropus* in its deeper body, its depth 4 to  $4\frac{1}{2}$  compared with  $5\frac{1}{2}$  to 7 in the Japanese species, in which it approaches *Etrumeus jacksoniensis*, differing from both in about only 25 lower gill rakers.

U.S.N.M. No. 93136, Iloilo. Bureau of Fisheries (14150). Length, 150 mm. June 1, 1908. Type.

21931. Caiholo River, Ulugan Bay, Palawan. Length, 75–80 mm.

5954, 5956. Cavite market. September 4, 1909. Length, 68–88 mm.

5 examples. Cebu market. September 4, 1909. Length, 68–88 mm. [1904].

19404, 19407. Iloilo market. March 28, 1908. Length, 75–115 mm. 3 examples.

14150 to 14156. Iloilo market. June 1, 1908. Length, 128–150 mm. [Type No. 14150.] Paratypes.

5150 to 5152. Manila market, Luzon. December 12 to 18, 1907. Length, 137–142 mm.

22550 to 22553. Manila market. January 13, 1908. Length, 85–121 mm.

21930 and 21932. Manila market. April 16, 1909. Length, 130–136 mm.

9 examples. Manila market. April 20, 1909. Length, 86–142 mm. [1529].

21 examples. Sorsogon market. March 12, 1909. Length, 87–128 mm.

4 examples. Tacloban market. July 25, 1909. Length, 134–139 mm.

A 1017. Buka Buka Island, Gulf of Tomini, Celebes. November 20, 1909. Length, 140 mm.

#### Subgenus ETRUMEUS Bleeker

Body elongately fusiform, depth over 5, lower gill rakers over 30 and the lateral scales 44 or more.

##### ETRUMEUS MICROPUS (Schlegel)

*Clupea micropus* SCHLEGEL, in Siebold's Fauna Japonica, Poiss., pts. 10–14, p. 236, pl. 107, fig. 2, 1846 (type locality: Southeast coast of Japan).

*Etrumeus micropus* BLEEKER, Verh. Batav. Genootsch. (Japan), vol. 25, p. (18)48, 1853 (Nagasaki); (Japan), vol. 26, p. 5, 1857 (Nagasaki); Act. Soc. Sci. Indo-Néerl., vol. 3, No. 3, p. 6, 1858 (Japan).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 467, 1868 (Japan).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 8, 1897.—JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 53, 1901 (reference).—JENKINS, Bull. U. S. Fish Comm., vol. 22 (1902), p. 432, 1904 (Honolulu).—SNYDER, Bull. U. S. Fish Comm., vol. 22 (1902), p. 521, 1904 (Honolulu).—JORDAN and EVERMANN, Bull. U. S. Fish Comm., vol. 23, pt. 1 (1903), p. 58, 1905 (Honolulu).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 628, 1906 (Nagasaki, Wakanoura, Misaki, Aomori, Tokyo).—KISHINOUE, Journ. Imp. Fisher. Bur. Tokyo, vol. 14, p. 100, pl. 18, fig. 1, 1907.—GÜNTHER, Journ. Mus. Godeffroy, pt. 16, p. 385, 1909 (Japan, Hawaii, California).—GILCHRIST and THOMPSON, Ann. South African Mus., vol. 6, p. 268, 1908–11 (Natal).—FRANZ, Abh. Bayer. Akad. Wiss., vol. 4, Suppl. vol. 1, p. 5, 1910 (Yokohama; Aburatsubo).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (Honolulu).—GILCHRIST, Marine Biol. Rep. South Africa, No. 1, p. 56, 1913 (Natal).—GILCHRIST and THOMPSON, Ann. Durban Mus., vol. 1, pt. 4, p. 295, 1917 (reference).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 184, 1920 (Tokyo market).—FOWLER, Copeia, No. 112, p. 82, 1922 (Hawaii).—FOWLER and BALL, Bishop Mus. Bull. 26, p. 5, 1925 (Lisiansky).—BARNARD, Ann. South African Mus., vol. 21, pt. 1, p. 108, 1925 (Port Elizabeth and Natal coast).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 120, 1925 (Misaki, Tokyo, Toba, Osaka, Kobe, Chosi).—MORT, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan and Jinsen, Korea).—FOWLER, Mem. Bishop Mus., vol. 10, p. 29, 1928 (Honolulu, Hilo, Oahu).—SOLDATOV and LINDBERG, Bull. Pacific Sci. Fisher. Inst., vol. 5, p. 37, 1930 (Far East seas).—SCHMIDT, Bull. Acad. Sci. U. S. S. R., 1930, p. 108 (Nagasaki); Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 18, 1931 (Kagoshima).—TANAKA, Jap. Fish. Life Colours, No. 45, 1933.—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 86, 1934, p. 410 (Natal).

*Etrumeus jacksoniensis* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 3, p. 36, pl. 4, fig. 1, 1879 (type locality: Port Jackson); vol. 4, p. 382, 1880 (Sydney Harbor); vol. 6, p. 261, 1881 (reference).—OGILBY, Cat. Fishes New South Wales, p. 56, 1886 (copied).—MCCULLOCH, Rec. West. Australian Mus., vol. 1, p. 211, pl. 29, 1914.—WAITE, Rec. South Australian Mus., vol. 2, No. 1, p. 36, fig. 51, 1921.—MCCULLOCH, Fishes of New South Wales, ed. 2, p. 16, pl. 4, fig. 50a, 1927; Australian Mus. Mem., vol. 5, p. 37, 1929 (reference).

*Etrumeus jacksonensis* OGILBY, Edible Fishes New South Wales, p. 186, 1893  
(Port Jackson).

*Perkinsia othonops* ROSA SMITH, Amer. Nat., p. 153, Feb. 1891 (type locality: San Diego, Calif.).

Depth  $5\frac{1}{3}$  to 7; head  $3\frac{1}{4}$  to  $4\frac{2}{5}$ , width  $1\frac{3}{4}$  to 3. Snout 3 to  $3\frac{1}{3}$  in head from snout tip; eye 3 to 4,  $1\frac{1}{5}$  to  $1\frac{1}{4}$  in snout, greater than interorbital, adipose lid covers eye; maxillary reaches  $\frac{7}{8}$  or quite to eye, expansion  $2\frac{3}{4}$  to 3 in eye, length  $2\frac{1}{2}$  to 3 in head from snout tip; teeth feeble, obsolete or very minute; interorbital 4 to  $5\frac{1}{2}$ , little elevated, level medially; opercle smooth; cheek with numerous radiating venules. Gill rakers 14 to  $16+33$  to 35, slender, lanceolate, slightly longer than gill filaments or  $1\frac{3}{4}$  to 2 of eye.

Scales (damaged) 47 to 55 in median lateral series to caudal base and 4 or 5 more on latter; 13 or 14 scales transversely at dorsal origin, 17 to 22 predorsal. Scales with 5 to 9 apical striae, also 2 to 4 above and same below but not connected; circuli parallel, convex, fine, none basally, none on apical half of scale.

D. III, 15, 1 or III, 16, 1, first branched ray  $1\frac{2}{3}$  to 2 in total head length; A. III, 8, 1, rarely III, 7, 1, first branched ray  $4\frac{7}{8}$  to  $6\frac{1}{8}$ ; caudal  $1\frac{1}{5}$  to  $1\frac{1}{4}$ , deeply forked, lobes slender, pointed; least depth of caudal peduncle  $3\frac{1}{3}$  to 4; pectoral  $1\frac{1}{2}$  to  $1\frac{7}{8}$ ; ventral 3 to  $3\frac{1}{8}$ .

Dusky lilac-brown on back, sides and below whitish. Iris white. Fins pale to whitish.

South Africa, Natal, West Australia, South Australia, New South Wales, Japan, Korea, California. I am unable to separate the Australian form on the single small specimen listed below.

U.S.N.M. No. 48815. Botany Bay, New South Wales. J. D. Ogilby. Length, 126 mm.

U.S.N.M. No. 44890. Japan. Japanese Government. Length, 233 to 243 mm., caudals broken. 3 examples.

U.S.N.M. No. 51029. Hawaiian Islands. U. S. Fish. Comm. (03596). Length, 235 mm.

U.S.N.M. No. 52695. Hawaiian Islands. U. S. Fish. Comm. (2770). Length, 248 mm.

U.S.N.M. No. 52775. Hawaiian Islands. U. S. Fish Comm. (03592). Length, 216 mm.

U.S.N.M. No. 55139. Honolulu. Albatross collection. Length, 208 mm., caudal ends broken.

U.S.N.M. No. 55441. Honolulu. Bureau of Fisheries (03115-03078). Length, 120-155 mm. 5 examples.

U.S.N.M. No. 55444. Honolulu. Albatross collection. Length, 31-110 mm. 21 examples.

U.S.N.M. No. 55553. Hawaiian Islands. Dr. O. P. Jenkins. Length, 233 mm.

U.S.N.M. No. 57628. Japan. P. L. Jouy. Length, 95-200 mm., caudal broken. In poor preservation.

U.S.N.M. No. 62329. Misaki. Jordan and Snyder. Length, 107-125 mm., caudal broken. 2 examples.

- U.S.N.M. No. 82905. Oahu, Hawaiian Islands. U. S. Exploring Expedition. Length, 180 mm., caudal damaged.
- U.S.N.M. No. 82906. Oahu, Hawaiian Islands. U. S. Exploring Expedition. Length, 150 mm., caudal damaged.
- A.N.S.P. Nos. 28009 to 28013. Hawaiian Islands. Bureau of Fisheries. Length, 70-216 mm.
- A.N.S.P. No. 28021. Hawaiian Islands. Bureau of Fisheries.

### Family CLUPEIDAE

Body oblong or elongate, mostly compressed. Head usually compressed. Snout never prominent. Premaxillaries not protractile. Mouth rather large. Jaws usually nearly equal. Teeth small, feeble or absent. Hind lower part of opercular region often with angular emargination, tips of larger branchiostegals abruptly truncate. Gills 4, slit behind last. Gill membranes separate, free from isthmus. Branchiostegals 6 to 15. Pseudobranchiae present. Vertebrae 40 to 56. Ovaries with oviduct. Scales thin, loose, cycloid, sometimes pectinate. Belly rounded or compressed, always with bony serratures, with or without spines. Dorsal median or somewhat posterior, rarely absent. Anal usually somewhat long. Caudal forked. Ventrals moderate or small.

A large family found in all warm seas. Many of the species are noteworthy for their abundance in individuals.

#### ANALYSIS OF GENERA

- a<sup>1</sup>.* CLUPEINAE. Anal moderate, rays 15 to 25; jaws equal; ventrals well developed.
  - b<sup>1</sup>.* One continuous anal.
  - c<sup>1</sup>.* Predorsal without median row of scutes.
    - d<sup>1</sup>.* Dorsal origin before ventral origin.
      - e<sup>1</sup>.* Upper jaw without median notch.
        - f<sup>1</sup>.* Last 2 anal rays equal, not enlarged.
          - g<sup>1</sup>.* Vomer with patch of small persistent teeth; vertebrae 46 to 51. *Clupea*
          - g<sup>2</sup>.* Vomer without persistent teeth; vertebrae 39 to 44. *Harengula*
        - f<sup>2</sup>.* Last 2 anal rays enlarged; transverse grooves on scales paired, their inner ends separated by interspace.
        - h<sup>1</sup>.* Opercle smooth, with obsolete or few if any striae. *Sardinella*
        - h<sup>2</sup>.* Opercle with radiating striae well developed. *Arengus*
      - e<sup>2</sup>.* Upper jaw with distinct median notch.
        - i<sup>1</sup>.* Lateral scales 40 to 50, transversely 13 to 20. *Macrura*
        - i<sup>2</sup>.* Lateral scales 75 to 100, transversely 27 to 34. *Gudusia*
      - w<sup>1</sup>.* Dorsal origin behind ventral origin. *Kowala*
      - c<sup>2</sup>.* Predorsal as well as abdomen with median row of scutes.
        - f<sup>1</sup>.* Premaxillaries little emarginate anteriorly; maxillary narrow; branchiostegals 8 or 9; dorsal insertion premedian. *Potamalosa*
        - j<sup>2</sup>.* Premaxillaries moderately emarginate anteriorly; maxillary wide; branchiostegals 4; dorsal insertion median or postmedian. *Hyperlophus*

- b*<sup>2</sup>. Anal divided, second detached as 2 enlarged connected rays----- *Corica*  
*a*<sup>2</sup>. ODONTOGNATHINAE. Anal very long, with more than 30 rays; lower jaw prominent; ventrals small or absent.  
*k*<sup>1</sup>. Toothed bone between terminal end of premaxillary and middle of maxillary----- *Pellona*  
*k*<sup>2</sup>. Ligament between terminal end of premaxillary and middle of maxillary.  
*l*<sup>1</sup>. Ventrals present----- *Ilisha*  
*l*<sup>2</sup>. No ventrals.  
*m*<sup>1</sup>. Dorsal present; maxillary broadly rounded behind, not extending beyond eye center... *Opisthoterpus*  
*m*<sup>2</sup>. Dorsal absent; maxillary tapers behind with age, extends to gill opening or beyond----- *Raconda*

### Genus CLUPEA Linnaeus

*Clupea* LINNAEUS, Syst. Nat., ed. 10, vol. 1, p. 317, 1758. (Type, *Clupea harengus* Linnaeus, designated by Gill, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 35.)

*Rogenia* VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 248, 1847. (Type, *Rogenia alba* Valenciennes, monotypic.)

*Uropterina* LIOY, Atti Soc. Ital. Sci. Nat. Milano, vol. 8, p. 113, 1865. (Type, *Uropterina platyrhachis* Liou, monotypic.) (Fossil.)

*Maneclupea* WHITLEY, Rec. Australian Mus., vol. 18, p. 332, 1932. (Type, *Clupea bassensis* McCulloch, orthotypic.)

Body elongate, compressed. Maxillary reaches below anterior or middle part of eye. Lower jaw projects, upper not notched. Teeth minute, present or absent on vomer. Opercle smooth. Lower gill rakers 34 to 51. Scales 44 to 65 in medial lateral series, 12 to 16 transversely. Vertebrae 42 to 59. Dorsal rays 14 to 21, origin nearly median from snout tip and caudal base. Anal rays 14 to 23, last 2 not enlarged. Caudal forked, without enlarged scales. Ventral rays 7 to 10, inserted below or before middle of dorsal.

Species rather few and found in the cooler seas of the globe. In northern seas the individuals are often excessively numerous. Spawning marine.

The reference to *Clupea cultrata* in Journ. Asiat. Soc. Bengal, vol. 3, p. 367, 1834, is of uncertain identity. Called "Chalwa" and "The Jumna runs about three miles south of the village, the Ganges 14 miles north by east," the ground was "strewed with fish, in number not less than three or four thousand," evidently having fallen from a violent wind storm.

### ANALYSIS OF SPECIES

- a*<sup>1</sup>. Ventral rays 9 (rarely 8 or 10), origin behind dorsal origin; vomer toothed; preopercle broad as opercle; lower gill rakers 40 to 51; D. 17 to 20; A. 14 to 20; vertebrae 50 to 59----- *pallasii*  
*a*<sup>2</sup>. Ventral rays 8, origin nearly opposite dorsal origin; vomer toothless, seldom with minute teeth; opercle broader than preopercle; lower gill rakers 34 to 41; D. 15 to 19; A. 17 to 21; vertebrae 34 to 41.

*b*<sup>1</sup>. Vomer toothed.

*c*<sup>1</sup>. Depth  $4\frac{1}{4}$ ; scales 48, transversely 13 or 14----- *antipodum*

*c*<sup>2</sup>. Depth 3 to  $3\frac{1}{2}$ ; scales 43 or 44, transversely 10 or 11----- *mülleri*

*b*<sup>2</sup>. Vomer toothless.

*d*<sup>1</sup>. A. 18 to 21.

*e*<sup>1</sup>. Depth  $3\frac{1}{4}$ ; scales 39 or 40----- *macrolepis*

*e*<sup>2</sup>. Depth  $4\frac{1}{2}$  to  $4\frac{1}{2}$ ; scales 44, transversely 12----- *bassensis*

*d*<sup>2</sup>. A. 28 or 29; depth  $3\frac{1}{3}$ ----- *schlegelii*

#### CLUPEA PALLASII Valenciennes

*Clupea pallasii* VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 253, 1847 (type locality: Kamtschatka).—JORDAN and HERRE, Proc. U. S. Nat. Mus., vol. 31, p. 630, fig. 4, 1906 (Aomori, Otaru, Matsushima, Kushiro, Same, Petropavlovsk).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1911, p. 205 (types of *Clupea mirabilis* and *Spratelloides bryoporus*).—SNYDER, Proc. U. S. Nat. Mus., vol. 42, p. 402, 1912 (Otaru; Fomokomai).—JORDAN and METZ, Mem. Carnegie Mus., vol. 6, p. 6, fig. 5, 1913 (copied) (Fusan; Chinnampo).—IZUKA and MATSUURA, Cat. Zool. Spec. Tokyo Mus. Vertebrata, p. 183, 1920 (Aomori).—FRASER, Contr. Canadian Biol. Toronto, No. 6, p. 9, 1921 (Biology).—JORDAN and HUBBS, Mem. Carnegie Mus., vol. 10, p. 121, 1925 (Kushiro and Hakodate).—MORI, Journ. Pan Pacific Res. Inst., vol. 3, p. 3, 1928 (Fusan and Genzan, Korea).

*Clupea pallasii* JORDAN and SNYDER, Annot. Zool. Japon., vol. 3, p. 53, 1901 (south to Nito).

*Clupea harengus pallasii* SOLDATOV and LINDBERG, Bull. Pacific Soc. Fisher. Inst., vol. 5, p. 39, pl. 3, 1930 (Far East seas).—TARANETZ, Bull. Pac. Sci. Inst. Fisher. Oceanogr., vol. 11, p. 54, fig. 32, 1937 (Far East seas).

*Clupea harengus* subsp. *pallasii* SCHMIDT, Trans. Pacific Comm. Acad. Sci. U. S. S. R., vol. 11, p. 20, 1931 (Fusan; Vladivostok).

*Clupea mirabilis* GIRARD, Proc. Acad. Nat. Sci. Philadelphia, 1854, pp. 138, 154 (type locality: San Francisco, Calif.); Rep. Pacific R. R. Surv., Zool., pt. 10, p. 329, 1858 (cotypes); p. 90, 1859 (cotypes).

*Clupea inermis* BASILEWSKY, Nouv. Mém. Soc. Nat. Moscou, vol. 10, p. 242, 1855 (type locality: Oriental Sea, Pekin, North China).—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 413, 1868 (copied).

*Spratelloides bryoporus* COPE, Proc. Amer. Philos. Soc., vol. 13, p. 25, 1873 (type locality: Sitka, Alaska).

*Clupea harengus* (not Linnaeus) ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, pp. 8, 9, 1897 (Sagalen).—TANAKA, Jap. Fish. Life Colours, No. 42, 1933.

Depth  $3\frac{3}{4}$  to  $4\frac{3}{4}$ ; head  $3\frac{1}{4}$  to  $4\frac{3}{4}$ , width  $2\frac{2}{5}$  to  $3\frac{1}{5}$ . Snout  $3\frac{2}{5}$  to 4 in head from upper jaw tip; eye  $2\frac{1}{2}$  to 5, 1 to  $1\frac{1}{2}$  in snout, greater than interorbital; maxillary reaches  $\frac{2}{5}$  to  $\frac{1}{2}$  in eye, expansion  $1\frac{2}{5}$  to  $1\frac{1}{2}$  in eye, length 2 to  $2\frac{1}{4}$  in head from snout tip; no notch in front of upper jaw medially; jaws toothless except series of minute teeth along lower maxillary edge; narrow band of minute teeth on vomer, none on palatines; interorbital  $3\frac{1}{4}$  to  $5\frac{3}{4}$ , slightly elevated, flat medially; opercle smooth. Gill rakers 18 to 20 + 35 to 43, slender, about  $\frac{7}{8}$  of eye; gill filaments  $\frac{3}{4}$  of gill rakers.

Scales with 53 or 54 in median lateral series to caudal base and 4 or 5 more on latter; 13 or 14 transversely, 22 to 28 predorsal. Ab-

dominal serrae 27 to  $30+12$  or 13. Ventral axillary flap  $\frac{3}{5}$  fin length. Opercle and cheek with radiating venules. Scales with 4 or 5 transverse marginal striae above, sometimes one or several may be complete with age; circuli all transversely parallel, very fine, none apical.

D. v, 13, 1, or iv, 14, 1, first branched ray  $1\frac{1}{10}$  to 2 in total head length; A. iii, 13, 1 or iii, 14, 1, first branched ray 4 to  $4\frac{1}{8}$ ; caudal  $4\frac{1}{3}$  to  $4\frac{1}{2}$  in rest of body, forked; least depth of caudal peduncle  $2\frac{3}{4}$  to  $2\frac{7}{8}$  in total head length; pectoral  $1\frac{2}{5}$  to  $1\frac{3}{5}$ ; ventral  $2\frac{1}{8}$  to  $2\frac{1}{2}$ .

Back brown to dusky olive above, sides and below silvery white. Dorsal and caudal dusted grayish, fins otherwise whitish.

China, Japan, Korea. Also north Pacific on coasts of North America.

U.S.N.M. No. 44889. Japan. Japanese Government. Length, 376–405 mm. 2 examples.

U.S.N.M. No. 48192. Otaru, Japan. S. Nozawa. Length, 195–305 mm. 3 examples.

U.S.N.M. No. 49452. Petropaulski Harbor, Kamchatka. Albatross collection. August 13, 1896. Length, 149–185 mm. 5 examples.

U.S.N.M. No. 62340. Same, Riknoku, Japan. Jordan and Snyder. Length, 48–62 mm. 11 examples.

U.S.N.M. No. 71116. Hokkaido, Japan. Albatross collection. 1906. Length, 55–70 mm. 7 examples.

U.S.N.M. No. 77498. Tokyo market (Aomori), Japan. Jordan and Snyder, 1900. Length, 270 mm.

U.S.N.M. No. 82602. Hakodate, Japan. Albatross collection. Length, 60–108 mm. 8 examples.

A.N.S.P. Nos. 1319 and 1320. San Francisco, California. Dr. A. L. Heermann. Length, 175–184 mm. Cotypes of *Clupea mirabilis* Girard.

A.N.S.P. No. 1211. Sitka, Alaska. George Davidson. Length, 293 mm. Type of *Spratelloides bryoporus* Cope. In poor preservation.

#### CLUPEA ANTIPODUM (Hector)

*Clupea sprattus* var. *antipodum* HECTOR, Colonial Mus. Governm. Surv. Dept., (Fishes New Zealand), p. 133, 1872 (type locality: Beach in Foveaux Strait; near Wellington).

*Clupea antipodum* WAITE, Rec. Canterbury Mus., vol. 1, No. 1, p. 10, 1907 (reference).—REGAN, Ann. Mag. Hist., ser. 8, vol. 19, p. 227, 1917 (Stewart Island; type of *Clupea holodon*).

*Amblygaster antipodus* WAITE, Rec. Canterbury Mus., vol. 1, No. 4, p. 317, 1912 (reference).

*Clupea holodon* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 18, p. 5, 1916 (type locality: Stewart Island, New Zealand).

Depth  $4\frac{1}{4}$ ; head 4 to  $4\frac{1}{3}$ . Eye 4 in head; maxillary reaches below front part of eye; elongate-ovate patch of teeth on vomer, broad ovate patch on tongue. Lower gill rakers 36.

Scales 48 in medial lateral series; 13 or 14 transversely; numerous radiating grooves at free edges of scales. Ventral scutes  $21+12$ , keeled and pointed.

D. 16 or 17, origin little nearer caudal base than snout end; A. 16 to 18; caudal peduncle longer than deep; ventrals 8-rayed, inserted below dorsal origin; vertebrae probably not fewer than 46. Length, 150 mm. (Regan.)

New Zealand.

**CLUPEA MÜLLERI Klunzinger**

*Clupea mülleri* KLUNZINGER, Sitzungsber. Akad. Wiss., Wien, math.-nat. Cl., vol. 80, pt. 1, p. 416, 1879 (type locality: New Zealand).

*Clupea muelleri* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 228, 1917 (Otago and Canterbury).

Depth 3 to  $3\frac{1}{3}$ ; head  $3\frac{1}{3}$  to  $3\frac{1}{2}$ , width  $2\frac{1}{3}$  to  $2\frac{1}{2}$ ? Snout  $3\frac{1}{5}$  in head from snout tip; eye  $3\frac{1}{3}$ , subequal with snout, greater than interorbital; maxillary reaches  $\frac{1}{3}$  in eye, expansion  $1\frac{2}{5}$  in eye, length 2 in head from snout tip; no teeth; interorbital 5, slightly concave. Gill rakers about 30 ?+37 ? finely lanceolate, equal eye; gill filaments about  $\frac{2}{5}$  gill rakers.

Scales about 36 ? in median lateral series to caudal base, narrowly imbricated; 8 ? between dorsal and ventral origins; about 17 predorsal forward to occiput. Abdominal serrae 22+8. Scales with 3 transverse conspicuous striae, of which 2 interrupted medially; circuli as close set parallel vertical striae.

D. III, 12, I ? (damaged), fin height about  $1\frac{3}{4}$  ? in total head length; A. II, 14 ? (damaged), base length  $1\frac{3}{5}$ ; least depth of caudal peduncle  $2\frac{1}{2}$ ; pectoral  $1\frac{3}{5}$ ; ventral  $2\frac{1}{2}$ .

Brown, discolored and apparently back little darker, now dark gray. Iris dark gray. Fins brown.

New Zealand. Regan mentions an elongate patch of teeth on vomer and ovate patch on tongue; lower gill rakers 36 to 39; scales 43 or 45, 10 or 11 transversely; ventral scutes 19 or 20+9 to 11; vertebrae, 42; length, 100 mm.

U.S.N.M. 39663. New Zealand. Otago University. Length, 89-90 mm., caudals broken. In very poor preservation.

**CLUPEA MACROLEPIS Steindachner**

*Clupea macrolepis* STEINDACHNER, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 41, pt. 1, p. 13, 1879 (type locality: Townsville, Cleveland Bay, Queensland).—McCULLOCH, Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

Depth  $3\frac{1}{4}$ , body strongly compressed, upper profile less convex than lower; head over  $4\frac{1}{2}$ , high as long. Snout 4 in head; eye nearly 3; mouth cleft small; mouth and palate toothless.

Scales 39 or 40 in median lateral series; 9 transversely. Caudal well scaled. Abdominal scutes 18+8, strong.

D. 17, origin eye diameter nearer snout tip than caudal base, height  $1\frac{1}{3}$  in head; A. 20 to 21 ?, begins behind end of dorsal base, equals dorsal height; lower caudal lobe eye diameter longer than head;

least depth of caudal peduncle  $2\frac{1}{2}$  in greatest body depth; pectoral scarcely half eye diameter shorter than head; ventral half of head, origin opposite dorsal origin.

Silvery band on back to caudal. Ends of caudal lobes dotted blackish. Length, 80 mm. (Steindachner.)

Queensland.

**CLUPEA BASSENSIS McCULLOCH**

*Clupea (Pomolobus) bassensis* McCULLOCH, Zool. Res. *Endeavour*, vol. 1, p. 16, pl. 4, fig. 3, 1911 (type locality: Bass Strait and Tasmania); Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

*Clupea bassensis* REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 18, p. 5, 1916 (Hobart).—WAITE, Rec. South Australian Mus., vol. 2, p. 37, fig. 52, 1921.—WHITLEY, Pap. Proc. Roy. Soc. Tasmania, 1928, p. 45, 1929 (Tamar River, Launceston, Tasmania).

*Maugeclupea bassensis* WHITLEY, Rec. Australian Mus., vol. 18, p. 332, 1932 (reference).

Depth  $4\frac{1}{2}$  to  $4\frac{4}{5}$ ; head  $3\frac{1}{2}$  to 4. Snout 3 in head from snout tip; eye  $3\frac{1}{5}$  to  $3\frac{3}{5}$ , subequal with snout, narrow adipose lid in front and behind; maxillary reaches  $\frac{1}{3}$  or nearly  $\frac{1}{2}$  in eye, expansion 2, length  $2\frac{1}{4}$  in head from snout tip; few wide spaced microscopic teeth in front of each jaw; interorbital  $\frac{2}{3}$  of eye, flat.

Scales 44 in medial lateral series; 12 transversely; large and cycloid. Abdominal scutes 21+11.

D.18(III, 14), first branched ray 2 in total head length; A. 18 to 20 (III, 16), first branched ray  $4\frac{1}{2}$ ; caudal  $1\frac{1}{5}$ , well emarginate; least depth of caudal peduncle  $2\frac{4}{5}$ ; pectoral  $1\frac{1}{2}$ ; ventral  $2\frac{2}{3}$ .

Silvery, upper third of body dark blue. Scattered darker specks on jaws, preorbitals and caudal peduncle. Dorsal, caudal, and pectoral rays dark spotted. Length, 177 mm. (McCulloch.)

Scarcely distinct from *Clupea fuegensis* Jenyns, but vertebrae fewer (46 compared with 49 to 51). Scales 46 to 48 in medial lateral series, 12 to 14 transversely. Ventral fins inserted little in advance of dorsal origin. Length, 130 mm. (Regan.)

South Australia, Tasmania.

**CLUPEA SCHLEGELII (Castelnau)**

*Meletta schlegelii* CASTELNAU, Proc. Zool. Acclimat. Soc. Victoria, vol. 2, p. 93, 1873 (type locality: Port Darwin).

*Clupea schlegelii* MACLEAY, Proc. Linn. Soc. New South Wales, vol. 6, p. 259, 1881 (reference) (error).

*Clupea schlegelii* McCULLOCH, Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

Depth  $3\frac{1}{3}$ , lower profile rather more convex than upper; head 4. Snout shorter than eye; eye  $2\frac{3}{4}$  in head; maxillary reaches  $\frac{1}{3}$  in eye; lower jaw protrudes; minute teeth on palate, none on vomer; cheeks, opercles and preopercle finely striated.

Scales regularly arranged, rather firm, strongly striated, edges finely crenulated.

D. 19, end midway between snout and end of tail; A. 28 or 29; caudal deeply forked; pectoral rays 16, twice long as ventral; ventral origin opposite middle of dorsal.

Bright silvery, back light purple. Front part of head and fins yellow. Opercle gilt. Length, 77 mm. (Castelnau.)

Northern Australia.

#### Genus HARENGULA Valenciennes

*Harengula* VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 261, 1847. (Type, *Harengula latulus* Valenciennes = *Clupea macroptalma* Ranzani, designated by Gill, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 36.)

*Clupalosa* BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 12, 1849. (Type, *Clupalosa bulan* Bleeker, monotypic.)

*Paralosa* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 111, 1866-72. (Type *Alausa melanura* (not *Clupea melanura* Cuvier) Valenciennes, monotypic.)

*Lile* JORDAN and EVERMANN, U. S. Nat. Mus., Bull. 47, pt. 1, p. 428, 1896. (Type, *Clupea stolifera* Jordan and Gilbert, monotypic.)

*Wilkesina* FOWLER and BEAN, Proc. U. S. Nat. Mus., vol. 63, p. 63, 1923. (Type, *Harengula fijiensis* Fowler and Bean, orthotypic.)

*Herklotssella* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1933. (Type, *Harengula dispilonotus* Bleeker, orthotypic.)

Body oblong or partly oblong, well compressed and body depth usually more than 3 in length. Edge of upper jaw without median notch. Dentition more or less complete, if so teeth present in jaws, on palatines, pterygoids and tongue; always absent from vomer. Vertebrae 39 to 44. Scales firmly adnate, thin. Dorsal with low scaly basal sheath. Abdominal scutes with distinct spines or smooth. Hind anal rays equal and transverse grooves of scales continuous.

Small firmly scaled sardines, related to *Sardinella* and *Sardina*, but most of the species smaller and with the last two anal rays not larger than those preceding. According to Regan's arrangement the American species fall within the subgenus *Harengula*, distinguished by the fewer lower gill rakers (27 to 33). *Lile* is here included as another subgenus with largely scaleless caudal and a well defined bluish lateral band. *Harengula dispilonotus* Bleeker is also placed in a distinct subgenus as it shows a strikingly different color pattern.

Doubtfully referred to this genus is the imperfectly described:

#### HARENGULA ABBREVIATA Valenciennes

*Harengula abbreviata* VALENCIENNES, Hist. Nat. Poiss., vol. 20, p. 296, 1847 (type locality: "New Holland").—GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 413, 1868 (copied).

*Sardinella abbreviata* McCULLOCH, Australian Mus. Mem., vol. 5, p. 38, 1929 (reference).

Depth slightly over 5 in total, body broad and thick set; head little shorter than body depth. Abdominal serrae very strong. Dorsal pointed, rays 19, A. 17. Caudal deeply forked. Pectoral pointed. Ventral inserted opposite fifth dorsal ray. Bluish or grayish on back, rest of body silvery. Tips of front dorsal rays black. Caudal gray. Length, 204 mm. (Valenciennes.)

Valenciennes says it was sent from New Holland by M. J. Vers-eaux, the last name evidently a misprint for Verreaux.

#### ANALYSIS OF SPECIES

- a<sup>1</sup>. HERKLOTELLA.* Back with 2 bluish saddlelike blotches; lower gill rakers 35; lateral scales 36 to 38----- *dispilonotus*
- a<sup>2</sup>.* Back without 2 black saddlelike blotches; 40 or more lateral scales.
- b<sup>1</sup>. CLUPALOSA.* Lower gill rakers 30 to 40.
  - c<sup>1</sup>.* Depth  $2\frac{1}{10}$ ; head  $3\frac{1}{4}$ ; eye  $2\frac{1}{4}$  in head----- *maccullochi*
  - c<sup>2</sup>.* Depth  $2\frac{3}{8}$ ; head  $3\frac{3}{4}$ ; eye  $2\frac{3}{4}$  in head----- *königsbergeri*
  - c<sup>3</sup>.* Depth 3; head  $3\frac{7}{8}$ ; eye  $3\frac{1}{4}$  in head----- *bulan*
  - c<sup>4</sup>.* Depth  $3\frac{1}{10}$ ; head  $3\frac{1}{4}$ ; eye  $2\frac{3}{4}$  in head----- *lipa*
  - c<sup>5</sup>.* Depth  $3\frac{1}{2}$  to 4; head  $3\frac{1}{3}$  to 4; eye 3 to  $3\frac{1}{3}$  in head----- *ovalis*
  - c<sup>6</sup>.* Depth 4 to  $4\frac{1}{4}$ ; head 4 to  $4\frac{1}{2}$ ; eye  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in head----- *schrammii*
- b<sup>2</sup>. PARALOSA.* Lower gill rakers 42 to 70.
  - d<sup>1</sup>.* Depth  $2\frac{1}{2}$  to  $3\frac{1}{2}$ ; eye 3 in head; lower gill rakers 45----- *castelnau*
  - d<sup>2</sup>.* Depth 3 to 4; eye  $3\frac{1}{3}$  to  $3\frac{2}{3}$ , in head.
    - e<sup>1</sup>.* Lower gill rakers 50.
      - f<sup>1</sup>.* Scales 38 to 48; dorsal with black spot at origin and apex black; tips and inner caudal edge black----- *tawilis*
      - f<sup>2</sup>.* Scales 40 to 42; tips of caudal lobes blackish----- *vittata*
      - f<sup>3</sup>.* Scales 44 to 46; caudal uniform----- *zunasi*
    - e<sup>2</sup>.* Lower gill rakers 60 to 70; scales 40----- *nymphaea*
    - d<sup>3</sup>.* Depth 4 to 5; eye  $3\frac{1}{2}$  to  $3\frac{2}{3}$  in head----- *dollfusi*

#### Subgenus HERKLOTELLA Fowler

Back with 2 black saddlelike blotches. Lower gill rakers 35. Lateral scales 36 to 38.

#### HARENGULA DISPILONOTUS Bleeker

*Harengula dispilonotus* BLEEKER, Nat. Tijdschr. Nederland. Indië, vol. 3, p. (445) 456, 1852 (type locality: Banka).—REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 389, 1917 (type).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 85, p. 246, 1933 (reference); vol. 86, p. 69 (Benoa; Sanoer, Bali), p. 86, 1934 (Sriracha).—HERRE, Fishes Herre Philippine Exped. 1931, p. 15, 1934 (Cebu).—ROXAS, Philippine Journ. Sci., vol. 55, p. 280, pl. 2, fig. 12 (scale), 1934 (Mindoro; Iloilo; Balabac).—ROXAS and MARTIN, Dept. Agr. Comm. Manila Tech. Bull. 6, p. 21, 1937 (reference).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 131, fig. 1, 1937 (Rayong, Siam).—HERRE and MYERS, Raffles Mus. Bull., No. 13, p. 12, 1937 (Singapore).—FOWLER, List Fish. Malaya, p. 26, 1938 (reference).

*Clupea dispilonotus* GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 429, 1868 (type).—WEBER, Siboga Exped., Fische, vol. 57, p. 9, 1913 (Kangeang Island).

*Clupea (Harengula) dispilonotus* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 111, pl. (3) 261, fig. 3, 1872 (Singapore, Banka, Bawean).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 60, 1913 (Kota Barn, Borneo; Kangean).—HARDENBERG, Treubia, vol. 14, livr. 2, p. 218, 1933 (Batavia).

*Sardinella dispilonotus* SUVATTI, Index Fish. Siam, p. 9, 1937 (reference).

Depth  $2\frac{1}{2}$  to 3; head  $3\frac{1}{2}$  to  $3\frac{3}{5}$ , width  $2\frac{1}{8}$  to  $2\frac{1}{3}$ . Snout  $3\frac{1}{2}$  to  $3\frac{3}{8}$  in head from snout tip; eye 3 to  $3\frac{1}{8}$ , greater than snout or interorbital; maxillary reaches  $\frac{1}{4}$  to  $\frac{1}{3}$  in eye, expansion  $1\frac{3}{5}$  to  $1\frac{4}{5}$ , length  $2\frac{1}{5}$  to  $2\frac{1}{4}$  in head from snout tip; teeth very minute, only those in front of mandible distinct; very fine teeth on palatines and tongue; interorbital 4 to  $4\frac{1}{4}$ , but very little convex or largely level medially; bones of cranium striate and side of head with radiating venules. Gill rakers 15 or  $16+34$  to 36, finely lanceolate,  $1\frac{1}{4}$  in eye; gill filaments  $\frac{3}{5}$  of gill rakers.

Scales caducous, 35 to 37 (pockets) in median lateral series; 10 or 11 transversely; 10 or 11 predorsal. Abdominal serrae 14 or 15+11 to 13. Scales with 4 transverse or vertical striae; circuli as very fine transverse parallel striae, none apically where surface entire and without pits or pores.

D. III, 14, I or III, 15, I, first branched ray  $1\frac{1}{3}$  to  $1\frac{2}{5}$  in total head length; A. III, 13, I to III 16, I, first branched ray 4 to  $4\frac{2}{3}$ ; least depth of caudal peduncle  $2\frac{2}{5}$  to  $2\frac{1}{2}$ ; pectoral  $1\frac{1}{3}$  to  $2\frac{2}{5}$ ; ventral  $1\frac{7}{8}$  to 2; caudal  $3\frac{1}{8}$  to  $3\frac{1}{2}$  in rest of body.

Back and upper surface drab gray, sides and below silvery white. On back below last dorsal rays and black saddle-like spot on upper caudal peduncle behind depressed dorsal another similar, both blotches usually with gray or ocellated whitish ring. Dorsal and caudal grayish, lower fins whitish.

Singapore, East Indies, Philippines.

A very handsome little fish, the scales caducous, largely silvery white and strongly marked with the ocellated black saddlelike blotches on the back, a feature which immediately distinguishes it from all other Indo-Pacific clupeoids. It is rather indifferently figured by Bleeker, as the first black blotch appears lateral though in all my specimens it is dorsal on the back or as if the dorsal fin divides it in half. Furthermore, Bleeker's figure lacks much of the detail of the head.

2 examples. Catbalogan, Samar. April 15, 1908. Length, 104–106 mm.

17 examples. Tacloban market. July 25, 1908. Length, 74–85 mm.

4 examples. Sandakan Bay, Borneo. March 21, 1908. Length, 80–90 mm.

2 examples. Sandakan Bay. March 2, 1909. Length, 74–80 mm.

## Subgenus CLUPALOSA Bleeker

Lower gill rakers 30 to 40. Back without black saddles.

## HARENGULA MACCULLOCHI Whitley

*Harengula maccullochi* WHITLEY, Rec. Austral. Mus., vol. 18, p. 143, fig. 2, 1931  
(type locality: Port Hedland, northwestern Australia).

Depth  $2\frac{1}{10}$ ; head  $3\frac{1}{3}$ . Snout  $3\frac{3}{4}$  in head from snout tip; eye  $2\frac{2}{3}$ , greatly exceeds snout, with broad adipose lids; maxillary reaches  $\frac{2}{3}$  in eye, length  $2\frac{1}{6}$  in head from snout tip; minute teeth on jaws and palatines, group of larger teeth on mandible anteriorly; vertex of head and to less extent opercles striated.

Scales less than 40 in lateral series; 12 transversely, predorsal 9; scapular area smooth, like most of head. Body scales large, deciduous, with margins striated or irregular, and subvertical lines mostly extending from top to bottom of each scale. Abdominal scutes 17 to 12.

D. 17, origin nearerer snout tip than caudal peduncle, first branched ray  $1\frac{2}{3}$  in total head length; A. 22, fin height 5, last rays not modified; caudal  $3\frac{1}{8}$  in rest of fish; least depth of caudal peduncle  $3\frac{1}{2}$  in total head; pectoral  $2\frac{2}{3}$ , nearly reaching ventral origin, rays 17; ventral rays 8, length  $2\frac{2}{3}$  in total head length, origin below anterior half of dorsal.

General color silvery, dark grayish above. Some horizontal dusky bars and a row of 13 dusky spots along upper part of sides. Another row of 6 similar ones below upper anteriorly. Tips of snout, dorsal, and caudal lobes brownish.

Length, 127 mm. (Whitley.)

Western Australia. Said to be an ally of *Harengula konigsbergeri*, but with fewer predorsal scales and dorsal rays and more anal rays.

## HARENGULA KONIGSBERGERI (Weber and Beaufort)

*Clupea (Harengula) konigsbergeri* WEBER and BEAUFORT, Verh. Akad. Wet. Amsterdam, vol. 17, p. 14, 1912 (type locality: Aru Islands); Fishes Indo-Australian Archipelago, vol. 2, p. 72, 1913 (type).

*Harengula konigsbergeri* REGAN, Ann. Mag. Nat. Hist. ser. 8, vol. 19, p. 390, 1917 (North West Australia and New Guinea).—FOWLER, Mem. Bishop Mus., vol. 10, p. 31, 1928 (compiled).

*Harengula koningsbergeri* McCULLOCH, Austral. Mus. Mem., vol. 5, p. 39, 1929 (reference).

Depth  $2\frac{2}{3}$ ; head  $3\frac{2}{3}$ . Snout shorter than eye, which  $2\frac{3}{4}$  in head; maxillary reaches  $\frac{1}{3}$  in eye or little beyond. Lower gill rakers 33.

Scales 42 in medial lateral series; 12 transversely. Ventral scutes 17 or  $18+11$  or 12.

D. 18 or 19; A. 20 or 21; ventrals below or little before middle of dorsal. Length, 115 mm. (Regan.)

Northwest Australia, Aru Islands, New Guinea.

## HARENGULA BULAN (Bleeker)

- Clupalosa bulan* BLEEKER, Verh. Batav. Genootsch. (Madura), vol. 22, p. 12, 1849  
 (type locality: Madura Strait near Bangcallang, Kammal and Surabaya, Java).
- Clupea (Harengula) bulan* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, p. 111, 1866-72 (Java and Madura).—WEBER and BEAUFORT, Fishes Indo-Australian Archipelago, vol. 2, p. 73, 1913 (compiled).
- Clupea bulan*? VINCIGUERRA, Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, p. 619, 1926 (Sarawak).
- Harengula bulan* McCULLOCH, Austral. Mus. Mem., vol. 5, p. 39, 1929 (North Australia).
- Clupea kowal* (not Rüppell) GÜNTHER, Cat. Fishes British Mus., vol. 7, p. 450, 1868 (Zanzibar, Pinang, Amoy, type of *Clupalosa bulan*).—KLUNZINGER, Verh. zool.-bot. Ges. Wien, vol. 21, p. 599, 1871 (types).—ELERA, Cat. Fauna Filip., vol. 1, p. 583, 1895 (Luzon, Cavite, Santa Cruz).—ISHIKAWA and MATSUURA, Prelim. Cat. Fishes Mus. Tokyo, p. 7, 1897.
- Clupea (Clupalosa) kowal* BLEEKER, Atlas Ichth. Ind. Néerland., vol. 6, pl. (8) 266, fig. 5, 1866-72.
- Sardinella brachysoma* (not Bleeker) FOWLER, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 12, p. 501, 1904 (Padang); Proc. Acad. Nat. Sci. Philadelphia, vol. 79, p. 257, 1927 (Santa Maria, Orani, Orion).
- Sardinella hypselosoma* (not Bleeker) FOWLER, Proc. Acad. Nat. Sci. Philadelphia, 1905, p. 489 (name only, on above); 1911, p. 206 (above materials).
- Harengula argyrotaenia* (not Bleeker) BEAN and WEED, Proc. U. S. Nat. Mus., vol. 42, p. 591, 1912 (Batavia, Java).
- Sardinella perforata* (not Cantor) REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 382, 1917 (type of *Clupalosa bulan*).

Depth 3; head  $3\frac{1}{8}$ , width  $2\frac{1}{2}$ . Snout  $4\frac{1}{4}$  in head from snout tip; eye  $3\frac{1}{4}$ , greater than snout or interorbital, adipose lids broadly covering eye; maxillary reaches  $\frac{1}{4}$  in eye, expansion  $\frac{1}{2}$  eye, length  $2\frac{1}{8}$  in head from snout tip; no teeth, palate apparently edentulous; interorbital  $4\frac{1}{2}$ , nearly level; cheeks venulose, radiating venules on opercle. Gill rakers  $22+40$ , finely lanceolate.

Scales 34 in median lateral series to caudal base and 4 more on latter; 9 transversely, 15 predorsal. Abdominal serrae  $18+11$ , edge very cultrate. Scales with 2 wide-set, transverse or vertical striae; circuli as fine parallel vertical striae basally, none apical.

D. III, 13, first branched ray  $1\frac{3}{5}$  in total head length; A. III, 16, first branched ray  $3\frac{1}{2}$ ; least depth of caudal peduncle  $2\frac{1}{4}$ ; pectoral  $1\frac{1}{2}$ ; ventral 2; caudal  $2\frac{4}{5}$  in rest of body, forked.

Owing to formalin largely brown, faded, except slightly darker shading on back due to minute dusky dots, general appearance uniformly dull. Iris neutral gray or slate. Fins all uniformly brown, caudal with dusky shading terminally.

Red Sea, Zanzibar, India, Pinang, East Indies, Philippines, Amoy. The interesting specimen described above agrees with Bleeker's account of *Clupalosa bulan*, which was based on an example 145 mm. long and later figured as *Clupea (Clupalosa) kowal*. Bleeker gives